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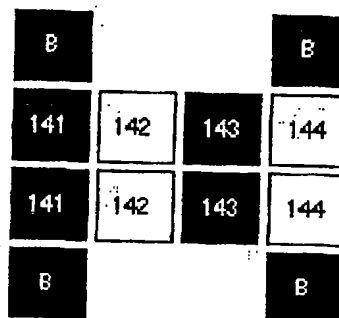
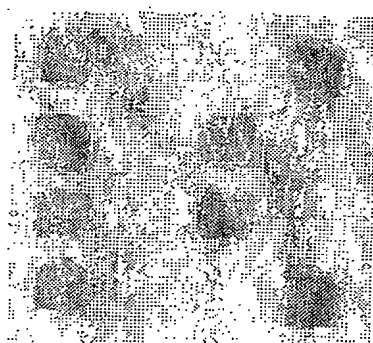
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**London SE1 2HW (GB)**(54) **KIT AND METHOD FOR DETERMINING HLA TYPE**

(57) HLA genotype of a test specimen is determined by hybridization of a nucleic acid sequence derived from the test specimen by using a substrate on which oligonucleotides of 10-24 nucleotide length derived from sequences of a group of genes belonging to HLA class I

or class II antigen on a human genome and including polymorphism of gene as alloantigens in the sequences are immobilized through covalent bonds. There are provided a typing kit and typing method that are suitable for processing of a large number of specimens and enable high accuracy typing by one test.

*Fig. 8*

**Description**Technical Field

**[0001]** The present invention relates to a typing kit and typing method for determining HLA genotypes. HLA typing is carried out to judge possibility of transplantation between immunogenetically different individuals. Specifically, its purpose is to provide genetic information to determine transplantation compatibility for transplantation of an organ or tissue such as bone marrow, kidney, liver, pancreas, islets of Langerhans or cornea. The kit of the present invention can also be applied to susceptibility test for a specific disease that is caused by a hereditary factor, or individual identification.

**[0002]** The present invention further relates to PCR primers used for the aforementioned kit and method and a method for producing the same.

Background Art

## 1. Human leukocyte antigen (HLA) types and importance of histocompatibility

**[0003]** In autogenous transplantation or transplantation between immunogenetically homologous individuals such as identical twins of a tissue or cells, a graft is taken without inducing rejection reactions. On the other hand, in transplantation between immunogenetically different individuals such as other family members or unrelated individuals (allogenic transplantation) or transplantation between different species such as human being and other primates (interspecific transplantation), transplantation immunity is established and a rejection reaction is induced against a graft. There are antigens inducing particularly intense transplantation immunity as targets in this reaction, which are called major histocompatibility antigens. These antigens are controlled by a group of genes called MHC (Major Histocompatibility Complex). MHC is classified into classes I, II and III. class I and class II genes code for HLA (Human Leukocytic Antigen), which are transplantation antigens. HLA antigens are proteins responsible for discriminating self and non-self in the immune mechanism. Since a large number of alleles exist on their gene loci, the genes coding for these antigens are known to be highly polymorphic.

**[0004]** Determination of genotypes (typing) of HLA provides information for determination of the possibility of transplantation between immunogenetically different individuals. Specifically, this is employed for transplantation of an organ or tissue such as bone marrow, kidney, liver, pancreas, islets of Langerhans or cornea. The HLA genotypes are considered to be associated with certain refractory diseases and can also be utilized as supplementary means for diagnosing chronic rheumatoid arthritis, IDDM, insulin autoimmune syndrome and so forth. Besides, HLA typing is applied in a paternity test or individual identification because of the genetic polymorphism of HLA antigens.

## 2. Genes involved in HLA typing and polymorphism

**[0005]** Human MHC is an HLA gene complex located on the short arm of the 6th chromosome. HLA antigens encoded by these genes include class I antigens controlled by HLA-A, -B, -C loci and class II antigens controlled by the HLA-D region (DR, DQ and DP).

**[0006]** class I antigens have a double-stranded structure composed of L-chain called  $\alpha 2$  microglobulin having a molecular weight of 12 kDa and H-chain having a molecular weight of 45 kDa. These antigens are involved in cellular immunity mediated by T cells, determine antigen specificity, and become target antigens in transplantation immunity. class II antigens have a double-stranded structure of two chains having molecular weights of 34 kDa and 29 kDa, respectively, determine antigen recognition and are involved in antigen presentation in humoral immunity. DP, DQ and DR in the HLA-D region are further subtyped according to polymorphism based on the amino acid or nucleotide sequence. DR is classified into about 20 subtypes, DQ is classified into about 10 subtypes, and DP is classified into a few subtypes. This large number of subtypes is attributed to the facts that the HLA antigens are composed of the  $\alpha$ -chain and the  $\beta$ -chain each having a different molecular weight and that only the  $\beta$ -chain serves as an alloantigenic determinant except for the DQ antigens. Moreover, the subtypes are further subdivided based on the amino acid sequences or the corresponding nucleotide sequences of the antigenic determinants.

## 3. Means for HLA typing

**[0007]** Serological test utilizing antiserum reactions and cytological methods utilizing blast transformation of lymphocytes have been generally used. However, not only time and labor are required for examination and operation is complicated, but also accuracy of obtainable results are not so high. Therefore, DNA-based typing methods utilizing PCR are being developed to overcome these drawbacks and put into practical use. Examples thereof include the

PCR-SSP method (2), PCR-RFLP method (3), PCR-SSOP method (4), PCR-SSCP method (5) and so forth.

**[0008]** In the PCR-SSP method, a gene sequence is confirmed by amplifying the hypervariable region of target HLA antigen to determine the HLA antigen type. In this method, a large number of specific primers must be prepared to enable high accuracy typing and an enormous number of times of PCR also must be performed. Thus, this method is not necessarily practical.

**[0009]** In the PCR-RFLP (PCR-restriction fragment length polymorphism) method, a nucleotide sequence is amplified by PCR so as to contain a region involved in HLA antigen typing and the obtained amplification product is digested with restriction enzymes. The nucleotide sequence of the amplification product is digested by using restriction enzymes cleaving different sites depending on the HLA type and separated by electrophoresis. Then, the type is determined based on the migration pattern. This method is characterized in that results can be rapidly obtained. However, the cleavage sites of the restriction enzymes may not necessarily exist in the sequence. Further, the amplification product must be digested with multiple kinds of restriction enzymes for one typing. Thus, this method is not practical to process a large amount of specimen.

**[0010]** In the PCR-SSOP (PCR-sequence specific oligonucleotide probe) method, a nylon membrane on which DNA amplified by primers specific to HLA gene is immobilized is prepared and respective HLA type specific oligonucleotide probes are hybridized for typing. In a modified method of PCR-SSOP, a membrane on which respective HLA type specific oligonucleotides are immobilized is prepared and DNA amplified by using HLA gene specific primers are hybridized. In the method of immobilizing amplified DNA, a membrane must be prepared for a probe of each type for hybridization and therefore much labor is required for multiple specimen typing. Since the substrate on which amplified DNA or oligonucleotides are immobilized is a membrane, a membrane having a large area must be prepared to perform high accuracy typing with one membrane. Therefore, the typing pattern may be complicated.

**[0011]** In the PCR-SSCP (PCR-single strand conformation polymorphism) method, DNA amplified by PCR is denatured to obtain single strands and changes in the high-order structure due to the difference in nucleotide sequences are detected by electrophoresis. In this method, all DNA of known types must be electrophoresed on the same gel. Thus, practical multiple specimen processing is almost impossible.

#### 4. Importance of high accuracy HLA typing

**[0012]** To achieve ideal transplantation, it is important that HLA types of donor and recipient are compatible with high accuracy. Therefore, a tissue or individual information typed in high accuracy must be clarified in advance. In this respect, HLA antigens of the donor and the recipient must be compared with all the types currently discovered for determination before transplantation. Even if no donor having completely compatible HLA types is found, a high success rate can be expected by performing transplantation between individuals having similar types of which high accuracy HLA types are determined. Further, it is also expected that load of recipient can also be relieved in immune responses such as a rejection reaction occurring after transplantation.

**[0013]** When high accuracy typing is carried out in personal identification, one completely compatible individual is found out of tens or hundreds of thousands of individuals, but such an individual can be identified in high accuracy. Furthermore, if high accuracy typing is performed for each gene locus of HLA antigens, the accuracy of the personal identification can be further improved.

**[0014]** In a medical scene requiring HLA type information or a situation requiring a personal identification, provision of highly reliable HLA type information is being required. It is important that typing of a large number of specimens can be easily and conveniently performed by HLA typing methods therefor. Currently, various methods are being developed and improved, but there remain many drawbacks that operation is complicated, multiple specimen processing is not possible and so forth.

#### Disclosure of the Invention

**[0015]** To solve these problems, an object of the present invention is to provide a kit and method that are suitable for processing of a large number of specimens and enable a large number of high accuracy typing tests by one test for one specimen.

**[0016]** The present invention provides a typing kit for determining HLA genotype of a test specimen by hybridization between a nucleic acid sequence derived from the test specimen and oligonucleotides, which comprises a substrate on which the oligonucleotides are immobilized through covalent bonds, wherein the oligonucleotides are of 10-24 nucleotide length and are derived from sequences of a group of genes belonging to HLA class I or class II antigen on a human genome and each of the oligonucleotides includes polymorphism of each gene as alloantigen in the sequence.

**[0017]** The present invention also provides a method for determining HLA genotype of a test specimen, which comprises allowing hybridization of the oligonucleotides on the substrate of the aforementioned typing kit with a nucleic acid sequence derived from the specimen and detecting occurrence of hybridization of the oligonucleotides and the

nucleic acid sequence derived from the specimen.

**[0018]** The present invention also provides the aforementioned typing kit, wherein class I antigen is an antigen controlled by a gene locus coding for any of HLA-A, HLA-B, HLA-C, HLA-D, HLA-E, HLA-F and HLA-G or a null gene and class II antigen is an antigen controlled by a gene locus coding for any of HLA-DQ, HLA-DR or HLA-DP or a pseudogene;

**[0019]** The aforementioned typing kit, wherein HLA-DQ is an antigen derived from any of DQA1, DQA2, DQB1 and DQB2 gene loci or a pseudogene;

the aforementioned typing kit, wherein HLA-DR is an antigen derived from any of DRA, DRB1, DRB3, DRB4 and DRB5 gene loci or a pseudogene; and

the aforementioned typing kit, wherein HLA-DP is an antigen derived from any of DPA1, DPA2, DPB1 and DPB2 gene loci or a pseudogene.

**[0020]** The present invention also provides an oligonucleotide, which comprises a nucleotide sequence based on any of the aforementioned oligonucleotides of 10-24 nucleotide length comprising a nucleotide sequence specific to each type of HLA gene sequences on the human genome and obtained by extending or shortening one of the oligonucleotides at 5' or 3' end or at both ends, and in which the sequence specific to each HLA type is not substituted.

**[0021]** The present invention also provides the aforementioned typing kit, wherein at least one of the aforementioned oligonucleotides is replaced with an oligonucleotide of 8-24 nucleotide length obtained by extending or shortening any of the nucleic acid sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1072 or 1080-1298 for a gene sequence on the genome at 5' or 3' end or at both ends without eliminating or changing nucleotides associated with the gene polymorphism to have optimized binding affinity for the aforementioned hybridization.

**[0022]** The present invention further provides the aforementioned typing kit, wherein at least one of the oligonucleotides is an oligonucleotide whose binding affinity for the hybridization is reduced by replacing an arbitrary nucleotide not involved in the gene polymorphism with a spacer compound, for example, a spacer compound having a nucleic acid frame that does not form a hydrogen bond with any nucleotide.

**[0023]** Furthermore, peptide nucleic acids (PNA) can be used instead of these oligonucleotides.

**[0024]** The present invention further provides a method for determining HLA genotype of a specimen, which comprises a step of carrying out low accuracy typing of HLA genotype of the specimen by performing first PCR amplification using primers for low accuracy genotyping and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with oligonucleotides contained in the aforementioned typing kit, and detecting occurrence of hybridization of the nucleic acid sequence derived from the specimen and each of the oligonucleotides; and

a step of carrying out high accuracy HLA genotyping of the specimen by performing second PCR amplification based on the above determination result using primers appropriately selected from primers for high accuracy genotyping and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with the oligonucleotides contained in the aforementioned typing kit, and detecting occurrence of hybridization of the nucleic acid sequence derived from the specimen and each of the oligonucleotides.

**[0025]** The present invention provides primers for low accuracy typing used for preparation of a probe for low accuracy typing, which consist of any oligonucleotide pair or an arbitrary combination of oligonucleotide pairs selected from a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 398 and 400 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 399 and 400 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 401 and 403 for amplifying DRB1; and

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 402 and 403 for amplifying DRB1.

**[0026]** The present invention further provides primers for high accuracy typing used for preparation of a probe for high accuracy typing based on result of low accuracy typing, which consist of any oligonucleotides pair or an arbitrary combination of oligonucleotides pairs selected from:

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 404 and 405 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 404 and 406 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 407 and 409 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 408 and 409 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 410 and 412 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 411 and 412 for amplifying DQB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 413 and 417 for amplifying DRB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 414 and 417 for amplifying DRB1;

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 415 and 417 for amplifying DRB1; and

a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 416 and 417 for amplifying DRB1.



**[0027]** The present invention further provides primers for high accuracy typing used for preparation of a probe for high accuracy typing, which consist of any oligonucleotide pair or an arbitrary combination of oligonucleotides pair selected from:

5 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 418 and 420 for amplifying DQA1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 419 and 420 for amplifying DQA1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 421 and 422 for amplifying DQB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 423 and 424 for amplifying DRA1;  
 10 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 425 and 428 for amplifying DRB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 426 and 428 for amplifying DRB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 427 and 428 for amplifying DRB1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 429 and 431 for amplifying DRB3;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 430 and 431 for amplifying DRB3;  
 15 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 432 and 433 for amplifying DRB4;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 434 and 435 for amplifying DRB4;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 436 and 437 for amplifying DRB5;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 438 and 439 for amplifying DRB6;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 438 and 440 for amplifying DRB6;  
 20 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 441 and 442 for amplifying DRB7;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 443 and 444 for amplifying DPA1;  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 445 and 446 for amplifying DPB1; and  
 a pair of oligonucleotides having nucleotide sequences of SEQ ID NOS: 445 and 447 for amplifying DPB1.

**[0028]** The term "class" used for HLA classes I and II in the present specification means classification based on the roles played in an organism. That is, the present specification is also according to this classification. class I antigen is a generic designation of HLA-A, HLA-B, HLA-C, HLA-D, HLA-E, HLA-F and HLA-G antigens. class II antigen is a generic designation of HLA-DQ, HLA-DR and HLA-DP antigens. Alloantigens are antigens characterizing individuals that belong to the same animal species but have genetic differences. Genetic differences mean differences in nucleotide sequences. Further, each of alloantigens classified based on genetic differences is designated as an alloantigen type.

**[0029]** In the present specification, the term "polymorphism" means a characteristic of having the same function but a different primary structure in a protein or DNA coding therefor.

**[0030]** In the present specification, the term "gene locus" means a position occupied by each HLA gene having polymorphism on a chromosome. As for gene loci of DR, DQ and DP antigens, gene loci of the DR antigens include DRA, DRB1, DRB3, DRB4 and DRB5, gene loci of the DQ antigens include DQA1, DQA2, DQB1 and DQB2, and gene loci of the DP antigens include DPA1, DPA2, DPB1 and DPB2.

**[0031]** In the present specification, the term "antigen derived from a gene locus" means an antigen translated from a gene present on the gene locus.

**[0032]** In the present specification, the term "nucleotides involved in gene polymorphism" means nucleotides having different primary sequences in genes coding for each alloantigen.

**[0033]** In the present specification, the term "test specimen" means a sample to be typed. In the present specification, it means chromosome DNA or RNA extracted from a tissue or somatic cell or a reactant enzymatically produced by using any of these as a template.

**[0034]** In the present specification, the term "homopolymer of thymidine residue" means a polymer obtained by repeatedly synthesizing deoxythymidine at 5' or 3' end of nucleotide sequence portion involved in typing. This synthesis of oligonucleotide can be performed by a commercially available DNA synthesizer.

**[0035]** Hereafter, a constitution of the kit of the present invention and a method of manufacturing the same, HLA typing method using the kit of the present invention, oligonucleotides for use in these kit and methods, a nucleic acid target derived from a test specimen human genome, which is a sample for use in the HLA typing using the kit of the present invention, and a method of manufacturing the same and primers for preparing the nucleic acid target will be explained.

<1> Synthetic oligonucleotide for use in the present invention

**[0036]** The synthetic oligonucleotides for use in the present invention are derived from human genomic genes involved in HLA typing and synthesized based on nucleotide sequences obtained from these genes. Hereafter, these oligonucleotides are also referred to as capture oligos.

**[0037]** Capture oligos are designed so that they should contain a type-specific nucleotide sequence region present in HLA gene of each type. The essential characteristic of the present invention is that the HLA typing is performed by

identifying whether a test human genome has these regions.

**[0038]** Typing of a type-specific nucleotide sequence in genes involved in HLA typing can be carried out by allowing hybridization of each type-specific capture oligo with a nucleic acid fragment target (also referred to as "nucleic acid target") having a part of nucleotide sequence of the genes involved in HLA typing of human chromosome DNA and determining with which capture oligo the fragment hybridizes.

**[0039]** The capture oligos can be prepared as synthetic oligonucleotides having a nucleotide sequence consisting of 10-24 nucleotides containing a nucleotide sequence specific to each type in a nucleotide sequence of gene involved in HLA typing. It is generally preferred that the capture oligos are designed so that the type-specific nucleotide sequence should be positioned in the center portions of the capture oligos. If the capture oligos are too short, it becomes difficult to detect hybridization. On the other hand, if the capture oligo is too long, inhibition of hybridization by a type-specific sequence does not occur. Therefore, the range of 10-24 nucleotides is preferred. However, this optimization of the capture oligo length primarily depends on characteristics of the sequence (content of specific nucleotide and repetition of the same nucleotide), and it has been confirmed by experiments according to the present invention that even a short chain can be used so long as it shows good binding property. In the process of hybrid formation of a capture oligo and a target, if there is an obstruction in the secondary structure negatively affecting the hybridization, a spacer or a nucleotide forming no hydrogen bond with any nucleotide can be introduced into the oligonucleotide sequence to obviate the obstruction. Further, the obstruction in the secondary structures of the target and capture oligo can also be obviated by extending or shortening the gene sequence on genome corresponding to the capture oligo at 5' or 3' end or at both ends of the capture oligo so that a type-specific sequence portion should be included.

**[0040]** DNA is usually used as the capture oligos, but a peptide nucleic acid (PNA) may also be used. The hybrids of a nucleic acid derived from a test human genome with a peptide nucleic acid have a higher  $T_m$  (melting temperature) compared with those of oligonucleotides and therefore they are expected to provide stable hybridization signals. The peptide nucleic acids can be readily synthesized by using a common peptide synthesizer.

**[0041]** Examples of capture oligo nucleotide sequences are shown as SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1078 and 1080-1298. These capture oligos are designed based on nucleotide sequence data obtained from publications and the home page of the Japanese Society for Histocompatibility and Immunogenetics (<http://square.umin.ac.jp/JSIH/frame.html>) and cover the whole HLA types.

**[0042]** Typing of a specific HLA type can be carried out by appropriately selecting a capture oligo from them and using it in a test.

**[0043]** The capture oligo length is, in general, in a range of 14-22 nucleotides. From the viewpoint of hybridization, 16-17 nucleotides is a typical size. Besides the nucleotide sequences of SEQ ID NOS: 1-397, oligonucleotides having a nucleotide sequence obtained by extending or shortening any of the HLA type gene sequences at 5' or 3' end or at both ends of the nucleotide sequences can be used as a capture oligo.

**[0044]** The nucleotide sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1078 and 1080-1298 may also be extended at either 5' or 3' end and shortened at the other end, but the length of a capture oligo is in a range of 10-24 nucleotides in any case.

**[0045]** In the present invention, the designed capture oligos well reflect the results of studies and researches before the present application. However, when additional information about nucleotide sequences of novel HLA types is obtained thereafter, novel capture oligos will be designed based on the method described in the present specification and they will fall within the claimed scope of the present application.

**[0046]** Synthesis of oligonucleotides, preparation of chromosome DNA, hybridization and PCR can be performed by usual methods known to those skilled in the art (see Maniatis, T. et al., "Molecular Cloning, A Laboratory Manual, second edition", Cold Spring Harbor Laboratory Press (1989)). The oligonucleotides can also be synthesized by using a commercially available DNA synthesizer.

## <2> Preparation of substrate for use in present invention

**[0047]** Material of a substrate on which oligonucleotides are immobilized is not particularly limited so long as the oligonucleotides can be stably immobilized. For example, there can be mentioned glass, synthetic resins such as polycarbonates and plastics. The form of the substrate is not particularly limited, but there can be mentioned a form of plate or film. A uniform and flat surface is suitable as a surface of the substrate.

**[0048]** The oligonucleotides can be immobilized on a substrate by using a method employed in usual hybridization such as physical absorption, electric bond and molecular covalent bond. In the examples of the present specification, substrates coated with carbodiimide groups or isocyanate groups on the surface thereof (Japanese Patent Laid-Open (Kokai) No. 08-023975) were used. To prepare the substrates coated with a material having carbodiimide groups or isocyanate groups on the surface thereof, employed was a method in which the substrate surfaces were coated with a polymer compound containing carbodiimide groups or isocyanate groups and irradiated with ultraviolet ray so that oligonucleotides can be covalently bonded and immobilized thereon. This is because marked improvement of immo-

bilization efficiency was successfully attained by irradiating a substrate having carbodiimide groups or isocyanate groups on the surface thereof with ultraviolet ray. As a linker for binding carbodiimide group or isocyanate group and an oligonucleotide, a compound having an amino group or imino group highly reactive to the carbodiimide group or isocyanate group is used. In case of the imino group, carbodiimide group or isocyanate group can be bound by polymerizing thymine at either end of the capture oligo.

**[0049]** When oligonucleotides are spotted, if the amount of spotted oligonucleotides is too small, sufficient reactivity between the oligonucleotides and the nucleic acid target may not be ensured and therefore typing may become difficult. Further, high-density spotting invites technical problems as well as high cost. In addition, a more precise and expensive detecting device (typically, a scanner) is required for determination of occurrence of hybridization utilizing fluorescent labeling of the nucleic acid target, chemical color development or the like. Therefore, the oligonucleotides are preferably immobilized on the substrate surface in a diameter of 10-1,000  $\mu\text{m}$ . The oligonucleotides can be immobilized by spotting an oligonucleotide solution on a substrate by using, for example, a spotting machine. It is usually preferable that the oligonucleotide solution is spotted substantially in a circular shape.

**[0050]** Each oligonucleotide is spotted at a plurality of sites on one single substrate, and the spots are preferably arranged in a grid pattern. When the spot size is 1000  $\mu\text{m}$  in diameter, the total number of the spots is preferably 1600 or less per  $\text{cm}^2$ , and when such spots are spotted in a square shape, the square dimension is preferably 40 x 40 or less. When the spot size is 10  $\mu\text{m}$  in diameter, the total number of spots is preferably 400 or less per  $\text{cm}^2$ , and when such spots are spotted in a square shape, the square dimension is preferably 20 x 20 or less. If the longitudinal and transverse sizes are different, the numbers along longitudinal and transverse directions can be adjusted depending on the shape.

### <3> Arrangement of oligonucleotides on substrate

**[0051]** To facilitate typing of each HLA type, oligonucleotides are preferably arranged on a substrate so that oligonucleotides to be used for determining each HLA type should be placed in one partition, in a line, or the like. Oligonucleotides suitable for low accuracy genotyping and those suitable for high accuracy genotyping may be immobilized on the same substrate to simultaneously carry out low accuracy genotyping and high accuracy genotyping. To perform low accuracy genotyping and high accuracy genotyping stepwise, a substrate on which oligonucleotides suitable for low accuracy genotyping are immobilized and a substrate on which oligonucleotides suitable for high accuracy genotyping are immobilized may be separately prepared.

**[0052]** Alternatively, the typing may be performed by preparing alignment of gene sequence of each HLA, setting a nucleotide sequence in which at least two nucleotide polymorphisms or sequence polymorphisms involving the HLA typing are observed in a nucleotide sequence consisting of 1-10 nucleotides as a patchwork segment, and finding the patchworks in gene sequences of all of the HLA genes and, performing typing by combination of the patchworks. To perform advanced typing, the typing may be performed by setting a nucleotide sequence in which at least one nucleotide polymorphism or sequence polymorphism are observed in a nucleotide sequence consisting of 1-10 nucleotides based on the alignment of the nucleotide sequences of HLA genes as a satellite segment, and finding the satellites in gene sequences of all of the HLA genes and, performing typing by combination of the satellites, whereby a type which cannot be discriminated by the patchworks may be discriminated. Typing using patchworks and satellites may make it possible to judge whether each of HLA typing of the test specimen is homozygote or heterozygote and determine the types of HLA simultaneously. The oligonucleotides may be prepared to be allocated so that the HLA types are determined by developing progressively the patchworks and satellites in a test specimen.

**[0053]** Spots on the substrate are usually arranged within an area of 1  $\text{cm}^2$ . Figs. 1-7 and 11-17 show examples of preferred positions of oligonucleotides immobilized on the substrate. One square in the figure represents a spot of each oligonucleotide. The indicated numbers represent sequence numbers of the oligonucleotides.

### <4> Preparation of nucleic acid from test sample and preparation of nucleic acid probe

**[0054]** Nucleic acid can be prepared from a test sample by the same way as a usual method of preparing nucleic acids from animal cells. For example, DNA can be prepared by a method described in Maniatis, T. et al., "Molecular Cloning, A Laboratory Manual, second edition", Cold Spring Harbor Laboratory Press (1989). DNA can also be extracted from cells obtained by culture in a similar manner. This method is a standard test method, but there are many alternative methods and any of these methods may be employed.

**[0055]** A nucleic acid target for use in HLA typing is prepared by using the obtained DNA. The nucleic acid target can be prepared by amplifying a nucleic acid by using primers designed so as to correspond to a nucleotide sequence of capture oligo. While DNA is usually used as the nucleic acid target, RNA may also be used. As a nucleic acid amplification method, there can be mentioned, for example, a method of amplifying the nucleic acid as DNA by PCR (polymerize chain reaction) or as RNA by in vitro transcription.

**[0056]** Primers used for PCR are designed so that a nucleic acid target should include a complementary nucleotide sequence of a capture oligo except for a sequence region specific to each HLA type. A nucleic acid target may be longer or shorter than a capture oligo, so long as it is capable of hybridization. To increase specificity of amplification reactions, initial amplification may be carried out by using preliminary primers for amplifying a region larger than the target nucleic acid probe and then nucleic acid amplification may be carried out by using the amplified DNA as a template and primers for obtaining the target nucleic acid probe.

**[0057]** There may be a plurality of type-specific nucleotide sequence regions involved in typing depending on HLA types. In such a case, nucleic acid targets corresponding to each specific region can be prepared.

**[0058]** Furthermore, typing of DQB and DRB is carried out by selecting primers for high accuracy typing based on results obtained by using a nucleic acid sequence amplified by primers for low accuracy typing and then carrying out high accuracy typing, or allowing hybridization of nucleic acid sequences amplified by using all of the low accuracy primers for DQB and DRB and nucleic acid sequences amplified by using all of the high accuracy primers for DQB and DRB in separate blocks on which different captures are immobilized and determining low accuracy or high accuracy type from the obtained respective results. For typing of DQA, DRA, DPA and DPB, high accuracy typing is performed by using nucleic acid sequences amplified by using primers for high accuracy typing.

**[0059]** If a primer for use in final nucleic acid amplification is labeled in advance, a labeled nucleic acid target can be obtained. The nucleic acid target may be labeled during or after nucleic acid amplification. As the label, those labeling substances similar to those for a probe for use in usual hybridization, such as fluorescent substances or haptens, can be used. Specifically, as the fluorescent substances, there can be mentioned, for example, fluoresceine (FITC), rhodamine, phycoerythrin (PE), Texas Red, cyanine fluorescent dyes and so forth. As the haptens, there can be mentioned biotin, digoxigenin (Dig), dinitrophenyl (DNP) and so forth.

**[0060]** Primers for preparing a nucleic acid target can be included in an HLA typing kit together with a substrate on which oligonucleotides are immobilized.

#### <5> Hybridization of oligonucleotides on substrate and nucleic acid target

**[0061]** Hybridization can be performed in the same way as usual nucleic acid hybridization. A specific procedure will be exemplified below.

**[0062]** A nucleic acid target is added to a fusion solution comprising a salt solution such as standard saline citrate (SSC), a blocking solution such as sodium dodecyl sulfate (SDS) or bovine serum albumin (BSA) and an additive for promoting fusion reactions. When the target is double-stranded, denaturation is performed by heating or the like. After a few  $\mu$ L of a nucleic acid target solution is added onto a substrate, heat treatment is performed for a few hours (usually at 37-70°C) so that a hybrid should be formed between an oligonucleotide immobilized on the substrate and the nucleic acid target.

**[0063]** 5 x SSC or 3 M tetramethylammonium chloride is added onto the substrate and heated (usually at 37-50°C). Then, nonspecific nucleic acids that do not form hybrids are removed from the substrate and only specific hybrids are selectively maintained on the substrate.

**[0064]** To detect a hybrid, a fluorescent substance or hapten introduced into the nucleic acid target is used. When a hapten is used, a solution containing a conjugate of a protein recognizing the hapten or a protein that binds to the hapten and alkaline phosphatase, horseradish peroxidase or the like (enzyme conjugate) is added onto the substrate and allowed to react at room temperature for several tens of minutes. A nonspecific adsorption reaction of the enzyme conjugate and the substrate can be prevented by completely coating regions on the substrate other than the regions on which oligonucleotides are immobilized with a protein such as casein before this binding reaction of the hapten and the enzyme conjugate is performed. This treatment can be carried out by, after the oligonucleotides are immobilized, adding a solution of a protein such as casein onto the substrate and leaving it at room temperature for a several tens of minutes.

**[0065]** After the binding reaction of the enzyme conjugate and the hapten of the nucleic acid target is completed, the substrate is washed with an appropriate buffer containing a surfactant to remove enzyme conjugates that have not bound to the hapten. Thus, only enzyme conjugates bound to the hapten in the nucleic acid target should remain on the substrate.

**[0066]** To visualize the hybrid, a compound that becomes insoluble only in the presence of a hapten and an enzyme conjugate is added. The generation of such an insoluble compound is amplified by enzymatic reaction, and hence the hybrid is visualized. As the compound used for this purpose, when the enzyme in the enzyme conjugate is alkaline phosphatase, there can be used nitroblue tetrazolium chloride (NBT) and 5-bromo-4-chloro-3-indolylphosphate p-toluidine salt (BCIP). When the enzyme is horseradish peroxidase, 3,3',5,5'-tetramethylbenzidine (TMB) or the like can be used.

**[0067]** HLA typing based on the obtained results of hybridization is carried out by observing pigmentation or fluorescence at positions where capture oligos are immobilized. That is, the positions showing pigmentation or fluorescence

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indicate a corresponding gene. When all of oligonucleotides belonging to each type show color development, the type is determined. For example, in Figs. 8-10 referred to in the examples, hybridization signals were obtained only for oligonucleotides of SEQ ID NOS: 141 and 143 out of SEQ ID NOS: 141-144, and thus the test specimen is typed as DQA\*0101. Correspondence of hybridization signals obtained at positions of capture oligos of SEQ ID NOS: 1-397 and HLA types are summarized in Tables 1-20.

Table 1.

| Correspondence of DQA1 types and high accuracy typing capture oligos |  |
|--|--|
| Type   | Corresponding capture oligos                       |
| DQA1*0101  | 1,4,7,10,12,14,16,18,22,24,27,31,35,39,42,47,51,53 |
| DQA1*01021   | 1,4,7,10,12,14,16,22,24,27,31,35,39,42,47,51,53    |
| DQA1*01022   | 1,4,7,10,12,14,16,20,22,24,27,31,35,39,42,47,51,53 |
| DQA1*0103  | 2,4,7,10,15,20,22,26,27,31,35,39,42,47,51,53       |
| DQA1*0104  | 1,4,7,10,12,14,16,18,22,24,27,31,35,39,42,47,51,53 |
| DQA1*0105  | 1,4,7,10,12,14,16,18,22,24,27,31,35,39,42,47,51,53 |
| DQA1*0201  | 1,5,8,10,15,19,23,24,28,32,37,39,42,47,52,53       |
| DQA1*03011   | 2,5,9,13,17,19,23,24,29,33,37,41,43,48,49,52,53    |
| DQA1*0302  | 2,5,9,13,17,19,23,24,29,33,36,41,43,49,52,53       |
| DQA1*0303  | 1,5,9,12,17,19,23,24,29,33,36,41,43,49,52,53       |
| DQA1*0401  | 2,6,8,10,12,14,16,21,22,25,30,34,38,41,44,48,52,54 |
| DQA1*05011   | 3,6,8,10,12,14,16,21,22,25,30,34,38,41,45,50,52,53 |
| DQA1*05012   | 1,6,8,10,12,14,16,20,22,25,30,34,38,41,45,50,52,53 |
| DQA1*05013   | 3,6,8,10,12,14,16,20,22,25,30,34,38,41,45,50,52,53 |
| DQA1*0502  | 8,10,12,14,16,20,22,25,30,34,38,40,45,50,52,53     |
| DQA1*0503  | 3,6,8,10,12,14,16,20,22,25,30,34,38,41,45,50,52,53 |
| DQA1*0504  | 3,6,8,11,14,16,20,22,25,30,34,38,41,45,50,52,53    |
| DQA1*06011   | 2,6,8,10,15,21,22,25,30,34,38,41,46,48,52,53       |
| DQA1*06012   | 8,10,15,21,22,25,30,34,38,41,46,48,52,53           |

Table 2.

| Correspondence of DQB types and low accuracy typing capture oligos |                              |
|--|------------------------------|
| Type   | Corresponding capture oligos |
| DQB1*0501  | 56                           |
| DQB1*0502  | 56                           |
| DQB1*05031   | 56                           |
| DQB1*06011   | 55                           |
| DQB1*06013   | 55                           |
| DQB1*0602  | 55                           |
| DQB1*0603  | 55                           |
| DQB1*0604  | 56                           |
| DQB1*06051   | 56                           |
| DQB1*0609  | 56                           |

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Table 2. (continued)

| Correspondence of DQB types and low accuracy typing capture oligos |                              |
|--|------------------------------|
| Type   | Corresponding capture oligos |
| DQB1*0610  | 55                           |
| DQB1*0611  | 55                           |
| DQB1*0612  | 56                           |
| DQB1*0614  | 55                           |
| DQB1*0201  | 57, 58                       |
| DQB1*0202  | 57, 58                       |
| DQB1*0203  | 57, 58                       |
| DQB1*03011   | 57                           |
| DQB1*03012   | 57                           |
| DQB1*0302  | 57                           |
| DQB1*03032   | 57                           |
| DQB1*0304  | 57                           |
| DQB1*0305  | 57                           |
| DQB1*0306  | 57                           |
| DQB1*0307  | 57                           |
| DQB1*0308  | 57                           |
| DQB1*0401  | 57                           |

Table 3.

| Correspondence of DQB types and high accuracy typing capture oligos |  |
|---|--|
| Type  | Corresponding capture oligos   |
| DQB1*0501   | 62,65,68,70,74,79,82,86,89,92,97,99,103,114,116,118,126,131,137,138  |
| DQB1*0502   | 62,65,68,70,74,79,82,86,89,93,97,99,104,114,116,118,126,130,137,138  |
| DQB1*05031  | 62,65,68,70,74,79,82,86,94,97,99,106,114,116,118,126,130,137,138     |
| DQB1*05032  | 74,79,82,86,94,97,99,105,114,116                                     |
| DQB1*0504   | 65,68,70,74,80,83,86,89,93,97,99,104,114,117,119,126,131             |
| DQB1*06011  | 63,66,69,75,80,84,94,97,99,106,114,117,120,124,127,132,135,139       |
| DQB1*06012  | 66,68,70,75,80,84,94,98,99,106,114,117,120,124,127,132,135,139       |
| DQB1*06013  | 63,66,69,75,80,84,94,97,99,106,114,117,120,124,127,132,135,139       |
| DQB1*0602   | 64,67,68,70,76,80,87,89,95,97,99,105,114,116,121,125,127,132,135,139 |
| DQB1*0603   | 62,67,68,70,77,79,87,89,95,97,99,105,114,116,121,125,127,132,135,139 |
| DQB1*0604   | 62,67,68,70,77,79,87,89,93,97,99,103,114,116,122,125,127,132,134,138 |
| DQB1*06051  | 62,65,68,70,77,80,87,89,93,97,99,103,114,116,122,125,127,132,134,138 |
| DQB1*06052  | 77,80,87,89,93,97,99,107,114,116,122,125,127,132                     |
| DQB1*0606   | 77,80,87,89,93,97,99,103,114,116,122,128,129,131                     |
| DQB1*0607   | 67,68,70,77,79,87,89,95,97,99,105,114,116,122,125,127,132            |
| DQB1*0608   | 67,68,70,77,79,87,89,95,97,99,103,114,116,121,127,132                |

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Table 3. (continued)

| Correspondence of DQB types and high accuracy typing capture oligos |   |
|---|---|
| Type  | Corresponding capture oligos  |
| DQB1*0609   | 62,67,68,70,77,80,87,89,93,97,99,103,114,116,122,125,127,132,134,138  |
| DQB1*0610   | 64,67,68,70,76,80,87,89,95,97,99,104,114,116,121,125,127,132,135,139  |
| DQB1*0611   | 67,68,70,76,80,87,89,95,97,99, 105,114,116,121,125,127,132,135,139    |
| DQB1*0612   | 62,67,68,70,77,80,87,89,93,97,99,103,114,116,121,125,127,132,134,138  |
| DQB1*0613   | 64,67,68,70,76,80,87,89,95,97,99,103,114,116,121,125,127,132,135      |
| DQB1*0614   | 67,68,70,77,79,87,89,95,97,99, 105,114,116,121,125,127,132,135,139    |
| DQB1*0201   | 60,61,62,67,71,78,81,85,90,100,108,114,116,123,128,129,131,136,140    |
| DQB1*0202   | 59,60,61,62,67,71,78,81,85,90,100,108,114,117,123,128,129,131,136,140 |
| DQB1*0203   | 62,67,71,78,81,85,90,100,109,114,116,117,123,128,129,131,136,140      |
| DQB1*03011  | 62,66,68,70,75,80,88,91,93,101,110,114,116,122,125,127,132,136,140    |
| DQB1*03012  | 66,68,70,75,80,87,91,93,101,110,114,116,122,125,127,132,136,140       |
| DQB1*0302   | 62,67,68,70,76,80,88,94,101,111,114,116,122,125,127,132,136,140       |
| DQB1*03032  | 62,67,68,70,76,80,88,94,101,110,114,116,122,125,127,132,136,140       |
| DQB1*0304   | 62,66,68,70,75,80,88,91,93,101,111,114,116,122,125,127,132,136,140    |
| DQB1*0305   | 62,67,72,74,80,87,94,101,111,114,116,122,125,127,132,136,140          |
| DQB1*0306   | 62,67,68,70,76,80,88,94,101,110,115,117,119,126,133,136,140           |
| DQB1*0307   | 62,67,68,70,76,80,88,96,101,111,114,116,122,125,127,132,136,140       |
| DQB1*0308   | 62,67,68,70,76,80,88,94,101,111,114,116,121,125,127,132,136,140       |
| DQB1*0401   | 64,67,73,74,80,87,94,102,112,113,115,117,119,126,133,136,140          |
| DQB1*0402   | 64,67,72,74,80,87,94,102,112,113,115,117,119,126,133,136,140          |

Table 4.

| Correspondence of DRA types and high accuracy typing capture oligos |                              |
|---|------------------------------|
| Type  | Corresponding capture oligos |
| DRA*0101  | 141,143                      |
| DRA*0102  | 142,144                      |

Table 5.

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (1), alleles whose serological antigen type is DR1 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | High accuracy                          |
| DRB1*0101  | 145                          | 166, 173, 187, 213, 246, 250           |
| DRB1*01021   | 145                          | 166, 173, 187, 213, 232, 236, 250      |
| DRB1*01022   | 145                          | 166, 173, 187, 213, 228, 232, 236, 250 |
| DRB1*0103  | 145                          | 166, 173, 187, 211, 215, 246, 250      |
| DRB1*0104  | 145                          | 173, 187, 213, 230, 250                |

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Table 5. (continued)

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (1), alleles whose serological antigen type is DR1 |                              |                              |
|--|------------------------------|------------------------------|
| Type   | Corresponding capture oligos |                              |
|  | low accuracy                 | High accuracy                |
| DRB1*0105  | 145                          | 173, 187, 192, 213, 246, 250 |
| DRB1*0106  | 145                          |                              |

Table 6.

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (2), alleles whose serological antigen type is DR2 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy                          |
| DRB1*15011   | 149                          | 157,187,194,201,211 ,212, 234, 247     |
| DRB1*15012   | 149                          | 157,187,194,201,211,212,233,247        |
| DRB1*15021   | 149                          | 157,18,7194,201,211 ,212, 246, 247     |
| DRB1*15022   |                              | 187, 194, 211 ,212, 247, 250           |
| DRB1*15023   | 149                          | 157,181,187,194,201,211, 212           |
| DRB1*1503  | 149                          | 157,178,187,194,201,211, 212, 234, 247 |
| DRB1*1504  | 149                          | 157, 187, 194, 201, 210, 212, 234, 247 |
| DRB1*1505  | 149                          | 157, 187, 194, 201, 212, 234, 247      |
| DRB1*1506  | 149                          | 187, 194, 196 201, 211 ,212, 247       |
| DRB1*1507  | 149                          | 157, 187, 201, 211, 212, 247           |
| DRB1*1508  | 149                          | 157, 187, 194 201 212, 246, 247        |
| DRB1*1509  | 149                          |  |
| DRB1*1510  | 149                          |  |
| DRB1*16011   | 149                          | 157, 187 201, 210 220, 246, 247        |
| DRB1*16012   | 149                          | 157, 187, 20, 210, 246, 247            |
| DRB1*16021   | 149                          | 157, 187, 201, 220, 246, 247           |
| DRB1*16022   | 149                          | 187, 201, 247                          |
| DRB1*1603  | 149                          | 157, 187 201, 210 ,221, 246, 247       |
| DRB1*1604  | 149                          | 187, 201, 210, 222, 247                |
| DRB1*1605  | 149                          | 187, 201, 211, 220, 247                |
| DRB1*1607  | 149                          | 157, 187, 201, 211, 220, 241, 246, 247 |
| DRB1*1608  | 149                          | 157, 184 201, 210, 220, 246, 247       |



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Table 7.

| Correspondence of DRB1 Types and low accuracy and high accuracy typing capture oligos (3), alleles whose serological antigen type is DR3 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy  |
| DRB1*03011   | 146                          | 171, 179, 184, 194, 216, 226, 229, 234, 229, 234, 248, 250 |
| DRB1*03012   | 146                          | 171, 179, 184, 194, 216, 226, 230, 234, 230, 234, 248, 250 |
| DRB1*03021   | 146                          | 174, 184, 216, 226, 229, 246, 248, 250                     |
| DRB1*03022   | 146                          | 174, 184, 216, 226, 230, 246, 248, 250                     |
| DRB1*0303  | 146                          | 174, 184, 216, 226, 229, 234, 248, 250                     |
| DRB1*0304  | 146                          | 171, 179, 187, 194, 216, 226, 229, 248, 250                |
| DRB1*0305  | 146                          | 171, 179, 184, 194, 216, 226, 229, 246, 248, 250           |
| DRB1*0306  | 146                          | 171, 179, 184, 216, 229, 234, 248, 250                     |
| DRB1*0307  | 146                          | 179, 184, 194, 216, 226, 229, 234, 248, 250                |
| DRB1*0308  | 146                          | 171, 179, 184, 194, 206, 216, 226, 229, 234, 248           |
| DRB1*0309  | 146                          | 171, 182, 184, 194, 216, 226, 229, 246, 250                |
| DRB1*0310  | 146                          | 171, 179, 184, 194, 200, 216, 226, 229, 234, 244, 248      |
| DRB1*0311  | 146                          | 171, 179, 184, 194, 216, 227, 229, 234, 248, 250           |
| DRB1*0312  | 146                          | 171, 179, 184, 194, 199, 216, 226, 229, 248                |
| DRB1*0313  | 146                          |  |
| DRB1*0314  | 146                          |  |
| DRB1*0315  | 146                          |  |
| DRB1*0316  | 146                          |  |
| DRB1*0317  | 146                          |  |

Table 8.

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (4), alleles whose serological antigen type is DR4 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy                          |
| DRB1*04011   | 147                          | 160, 169, 180, 216, 246, 249, 250      |
| DRB1*04012   | 147                          | 160, 169, 183, 216, 246, 249, 250      |
| DRB1*0402  | 147                          | 160, 169, 180, 211, 215, 234, 249, 250 |
| DRB1*0403  |                              | 160, 169, 180, 213, 223, 234, 249, 250 |
| DRB1*04031   | 147                          |  |
| DRB1*04032   | 147                          | 161, 169, 180, 201, 213, 223, 234, 249 |
| DRB1*0404  | 147                          | 160, 169, 180, 213, 234, 249, 250      |
| DRB1*04051   | 147                          | 160, 169, 180, 199, 213, 246, 249      |
| DRB1*04052   | 147                          | 160, 169, 180, 193, 199, 213, 246      |
| DRB1*0406  | 147                          | 160, 169, 180, 187, 213, 223, 234, 250 |

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Table 8. (continued)

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (4), alleles whose serological antigen type is DR4 |                              |   |
|--|------------------------------|---|
| Type   | Corresponding capture oligos |   |
|  | low accuracy                 | high accuracy                               |
| DRB1*0407  | 147                          | 160, 169, 180, 213, 223, 246, 249, 250      |
| DRB1*0408  | 147                          | 160, 169, 180, 213, 246, 249, 250           |
| DRB1*0409  |                              | 169, 180, 199, 216, 249                     |
| DRB1*0410  | 147                          | 160, 169, 180, 199, 213, 234, 249           |
| DRB1*0411  | 147                          | 160, 169, 180, 199, 213, 223, 234, 249      |
| DRB1*0412  | 147                          | 160, 169, 199, 211, 222, 234, 249           |
| DRB1*0413  |                              | 169, 180, 216, 234, 249, 250                |
| DRB1*0414  |                              | 169, 180, 211, 215, 249, 250                |
| DRB1*0415  | 147                          | 160, 169, 180, 206, 210, 249                |
| DRB1*0416  |                              | 169, 180, 207, 216, 249                     |
| DRB1*0417  |                              | 169, 180, 199, 213, 223, 249                |
| DRB1*0418  |                              | 180, 211, 222, 234, 249, 250                |
| DRB1*0419  |                              | 169, 180, 187, 213, 246, 250                |
| DRB1*0420  |                              | 169, 180, 187, 213, 223, 250                |
| DRB1*0421  | 147                          | 160, 169, 180, 187, 216, 246, 250           |
| DRB1*0422  | 147                          | 160, 169, 180, 216, 226, 229, 234, 249, 250 |
| DRB1*0423  | 147                          | 160, 169, 180, 213, 245, 249, 250           |
| DRB1*0424  | 147                          | 160, 169, 180, 199, 214, 246, 249           |
| DRB1*0425  | 147                          | 160, 169, 180, 210, 222, 249, 250           |
| DRB1*0426  | 147                          | 160, 169, 180, 209, 216, 249                |
| DRB1*0427  | 147                          | 160, 169, 118, 213, 223, 236, 249, 250      |
| DRB1*0428  | 147                          | 160, 169, 180, 194, 199, 213, 246, 249      |
| DRB1*0429  | 147                          | 160, 169, 180, 197, 199, 213, 246, 249      |
| DRB1*0430  | 147                          | 160, 169, 180, 195, 213, 246, 249           |
| DRB1*0431  | 147                          | 160, 169, 180, 213, 222, 246, 249, 250      |
| DRB1*0432  | 147                          | 160, 169, 180, 219, 249, 250                |
| DRB1*0433  | 147                          |   |
| DRB1*0434  | 147                          |   |

Table 9.

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (5), alleles whose serological antigen type is DR5 and whose subtype is DR11 |                              |                         |
|--|------------------------------|-------------------------|
| Type   | Corresponding capture oligos |                         |
|  | low accuracy                 | high accuracy           |
| DRB1*11011   | 146                          | 194, 206, 210, 246, 249 |

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Table 9. (continued)

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (5), alleles whose serological antigen type is DR5 and whose subtype is DR11 |            |                              |  |
|--|------------|------------------------------|--|
| 5  | Type       | Corresponding capture oligos |  |
|  |            | low accuracy                 | high accuracy                          |
|  | DRB1*11012 | 146                          | 194, 206, 210, 239, 246, 249           |
| 10   | DRB1*11013 | 146                          | 194, 206, 210, 220, 246, 249           |
|  | DRB1*1102  | 146                          | 194, 206, 211, 215, 234, 249           |
|  | DRB1*1103  | 146                          | 194, 206, 210, 220, 246, 249           |
|  | DRB1*11041 | 146                          | 194, 206, 210, 234, 249                |
| 15   | DRB1*11042 | 146                          | 194, 206, 210, 234, 239, 249           |
|  | DRB1*1105  | 146                          | 194, 206, 210, 246, 249                |
|  | DRB1*1106  | 146                          | 194, 206, 210, 236, 249                |
| 20   | DRB1*1107  | 146                          | 194, 206, 216, 226, 229, 234, 249      |
|  | DRB1*11081 |                              | 194, 206, 246, 249                     |
|  | DRB1*11082 |                              | 194, 206, 246, 249                     |
|  | DRB1*1109  |                              | 179, 184, 194, 206, 210, 246, 248      |
| 25   | DRB1*1110  |                              | 179, 188, 194, 206, 210, 248           |
|  | DRB1*1111  |                              | 194, 206, 210, 215, 246, 249           |
|  | DRB1*1112  |                              | 188, 194, 206, 210                     |
| 30   | DRB1*1113  | 146                          | 179, 188, 194, 206, 214, 232, 234, 248 |
|  | DRB1*1114  | 146                          | 194, 206, 211, 215, 246, 249           |
|  | DRB1*1115  | 146                          | 186, 194, 206, 210, 246                |
|  | DRB1*1116  | 146                          | 179, 184, 194, 206, 211, 215, 248      |
| 35   | DRB1*1117  | 146                          | 179, 188, 206, 214, 223, 232, 234, 248 |
|  | DRB1*1118  | 146                          | 194, 206, 211, 234, 249                |
|  | DRB1*1119  | 146                          | 194, 206, 211, 246, 249                |
| 40   | DRB1*1120  | 146                          | 179, 184, 194, 206, 211, 215, 246, 248 |
|  | DRB1*1121  | 146                          | 194, 206, 211, 215, 249                |
|  | DRB1*1122  | 147                          | 162, 194, 206 210, 246, 247, 249       |
|  | DRB1*1123  | 146                          | 194, 206, 210, 222, 249                |
| 45   | DRB1*1124  | 146                          | 185, 194, 206, 210                     |
|  | DRB1*1125  | 146                          | 194, 206, 210, 222, 234, 249           |
|  | DRB1*1126  | 146                          | 194, 206, 213, 234, 249                |
| 50   | DRB1*1127  |                              | 194, 206, 210, 230, 249                |
|  | DRB1*11271 | 146                          |  |
|  | DRB1*11272 | 146                          |  |
|  | DRB1*1128  | 146                          | 184, 194 206                           |
| 55   | DRB1*1129  | 146                          | 187, 194, 206, 210, 246                |
|  | DRB1*1130  | 154                          | 165, 194, 206, 210, 246, 249           |

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Table 9. (continued)

| Type      | Corresponding capture oligos |                              |
|-----------|------------------------------|------------------------------|
|           | low accuracy                 | high accuracy                |
| DRB1*1131 | 146                          | 194, 208, 211, 246, 249      |
| DRB1*1132 | 146                          | 194, 206, 210, 224, 246, 249 |
| DRB1*1133 | 146                          | 194, 210, 242, 246, 249, 250 |
| DRB1*1134 | 146                          | 194, 206, 213, 234, 249      |
| DRB1*1135 | 146                          | 194, 210, 234, 242, 249, 250 |
| DRB1*1136 | 146                          |                              |
| DRB1*1137 | 146                          |                              |

Table 10.

| Type       | Corresponding capture oligos |  |
|------------|------------------------------|--|
|            | low accuracy                 | high accuracy                                    |
| DRB1*1201  | 146                          | 158, 172, 191, 194, 202, 211, 220, 232, 236, 248 |
| DRB1*12021 | 146                          | 158, 172, 191, 194, 202, 210, 220, 232, 246, 248 |
| DRB1*12022 | 146                          | 158, 172, 191, 194, 202, 210, 220, 248           |
| DRB1*12032 | 146                          | 158, 172, 191, 194, 202, 211, 220, 234, 248      |
| DRB1*1204  | 146                          | 158, 172, 191, 194, 206, 211, 220, 232, 248      |
| DRB1*1205  | 146                          | 158, 172, 190, 194, 202, 211, 220, 232, 236, 248 |
| DRB1*1206  | 146                          |  |

Table 11.

| Type       | Corresponding capture oligos |  |
|------------|------------------------------|--|
|            | low accuracy                 | high accuracy                          |
| DRB1*1301  | 146                          | 179, 184, 194, 211, 215, 234, 248, 250 |
| DRB1*1302  |                              | 179, 184, 194, 211, 215, 246, 248, 250 |
| DRB1*13021 | 146                          |  |
| DRB1*13022 | 146                          |  |
| DRB1*12031 | 146                          | 199, 211, 218, 239, 246, 249           |
| DRB1*13032 |                              | 199, 211, 218, 239, 246, 249           |
| DRB1*13032 | 146                          |  |
| DRB1*1304  | 146                          | 194, 199, 211, 215, 234, 249           |
| DRB1*1305  | 146                          | 179, 184, 194, 210, 246, 248, 250      |

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Table 11. (continued)

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (7), alleles whose serological antigen type is DR6 and whose subtype is DR13 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy                                    |
| DRB1*1306  | 146                          | 179, 184, 194, 211, 234, 248, 250                |
| DRB1*13071   | 146                          | 210, 246, 249, 250                               |
| DRB1*13072   | 146                          | 201, 210, 246, 249                               |
| DRB1*1308  | 146                          | 179, 188, 211, 215, 234, 248, 250                |
| DRB1*1309  | 146                          | 179,184,194,211, 212, 234, 248, 250              |
| DRB1*1310  | 146                          | 179, 184, 194, 211, 218, 234, 248,250            |
| DRB1*1311  | 146                          | 194, 210, 249, 250                               |
| DRB1*1312  | 146                          | 199, 211, 246, 249                               |
| DRB1*1313  | 146                          | 199, 211, 222, 246, 249                          |
| DRB1*1314  |                              | 194, 210, 246, 249, 250                          |
| DRB1*13142   | 146                          |  |
| DRB1*1315  | 146                          | 174, 184, 194, 211, 215, 234, 248, 250           |
| DRB1*1316  | 146                          | 179, 184, 194, 211, 215, 235, 248, 250           |
| DRB1*1317  | 146                          | 158, 194, 211, 215, 234, 249, 250                |
| DRB1*1318  | 146                          | 179, 184, 194, 210, 222, 234, 248, 250           |
| DRB1*1319  | 146                          | 174, 188, 211, 215, 222, 234, 248, 250           |
| DRB1*1320  | 146                          | 179, 184, 194, 215, 234, 248, 250                |
| DRB1*1321  | 146                          | 194, 199, 210, 246, 249                          |
| DRB1*1322  | 146                          | 194, 211, 215, 234, 249, 250                     |
| DRB1*1323  | 146                          | 194, 211, 215, 239, 246, 249, 250                |
| DRB1*1324  | 146                          | 194, 210, 215, 234, 249, 250                     |
| DRB1*1325  | 146                          | 194, 249, 250                                    |
| DRB1*1326  | 146                          | 174, 184, 201, 210, 220, 248                     |
| DRB1*1327  | 146                          | 171, 179, 184, 194, 211, 215, 220, 234, 248, 250 |
| DRB1*1328  | 146                          | 179, 184, 194, 211 215, 237, 248, 250            |
| DRB1*1329  | 146                          | 179, 184, 194, 215, 246, 248, 250                |
| DRB1*1330  | 146                          | 194, 199 211, 246, 249                           |
| DRB1*1331  | 146                          | 179, 184 194 211 215, 246, 248, 250              |
| DRB1*1332  | 146                          | 179, 184, 199, 211, 215, 234, 248                |
| DRB1*1333  | 146                          | 199, 211, 218, 225, 229, 249                     |
| DRB1*1334  | 146                          | 179, 189, 194 ,211, 215, 240, 246, 248, 250      |
| DRB1*1335  | 146                          |  |
| DRB1*1336  | 146                          |  |
| DRB1*1337  | 146                          |  |
| DRB1*1338  | 146                          |  |

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Table 11. (continued)

| Type      | Corresponding capture oligos |               |
|-----------|------------------------------|---------------|
|           | low accuracy                 | high accuracy |
| DRB1*1339 | 146                          |               |
| DRB1*1340 | 146                          |               |
| DRB1*1341 | 146                          |               |

Table 12.

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (8), alleles whose serological antigen type is DR6 and whose subtype is DR14 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy                                    |
| DRB1*1401  | 146                          | 179, 188, 200, 214, 223, 232, 234, 244, 248      |
| DRB1*1402  | 146                          | 174, 184, 213, 246, 248, 250                     |
| DRB1*1403  | 146                          | 174, 184, 222, 246, 248, 250                     |
| DRB1*1404  | 146                          | 158, 179, 188, 200, 214, 223, 232, 234, 244, 248 |
| DRB1*1405  | 146                          | 159, 179, 188, 205, 214, 223, 232, 234, 248      |
| DRB1*1406  | 146                          | 174, 184, 213, 234, 248, 250                     |
| DRB1*1407  | 146                          | 179, 188, 200, 214, 223, 232, 244, 248           |
| DRB1*1408  | 146                          | 179, 188, 203, 214, 223, 232, 234, 244, 248      |
| DRB1*1409  | 146                          | 179, 184, 213, 246, 248, 250                     |
| DRB1*1410  | 147                          | 160, 179, 188, 200, 214, 223, 232, 234, 244, 248 |
| DRB1*1411  | 146                          | 158, 179, 188, 206, 214, 223, 232, 248           |
| DRB1*1412  |                              | 174, 184, 222, 248, 250                          |
| DRB1*1413  | 146                          | 174, 184, 199, 213, 248                          |
| DRB1*1414  | 146                          | 179, 188, 214, 223, 232, 246, 248, 250           |
| DRB1*1415  |                              | 158, 179, 188, 210, 222, 234, 248, 250           |
| DRB1*1416  | 146                          | 179, 188, 200, 211, 215, 234, 244, 248           |
| DRB1*1417  | 146                          | 179, 184, 194, 213, 234, 248, 250                |
| DRB1*1418  | 146                          | 174, 184, 205, 214, 223, 232, 234, 248           |
| DRB1*1419  | 146                          | 174, 184, 216, 246, 248, 250                     |
| DRB1*1420  | 146                          | 174, 188, 213, 248, 250                          |
| DRB1*1421  | 146                          | 179, 184, 194, 216, 248, 250                     |
| DRB1*1422  | 146                          | 179, 188, 200, 210, 244, 246, 248                |
| DRB1*1423  | 146                          | 179, 188, 214, 223, 232, 234, 248, 250           |
| DRB1*1424  | 146                          | 174, 184, 211, 212, 246, 248, 250                |
| DRB1*1425  | 146                          | 200, 210, 244, 249                               |
| DRB1*1426  | 146                          | 170, 179, 188, 200, 214, 223, 232, 234, 244, 248 |

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Table 12. (continued)

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (8), alleles whose serological antigen type is DR6 and whose subtype is DR14 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy                                |
| DRB1*1427  | 146                          | 174, 184 210, 222, 246, 248, 250             |
| DRB1*1428  | 146                          | 158, 179, 188, 200, 214, 223, 232, 244, 248  |
| DRB1*1429  | 146                          | 174, 184, 213, 236, 248, 250                 |
| DRB1*1430  | 146                          | 179, 184 194, 213, 246, 248, 250             |
| DRB1*1431  | 146                          | 158, 179, 188, 200, 214, 232, 234, 244, 2480 |
| DRB1*1432  | 146                          |  |
| DRB1*1433  | 146                          | 179, 184, 194, 213, 223, 234, 248, 250       |
| DRB1*1434  | 146                          |  |
| DRB1*1435  | 146                          |  |
| DRB1*1436  | 146                          |  |

Table 13.

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (9), alleles whose serological antigen type is DR7, DR8, DR9 or DR10 |                              |   |
|--|------------------------------|---|
| Type   | Corresponding capture oligos |   |
|  | low accuracy                 | high accuracy   |
| DRB1*0701  |                              | 164, 169, 170, 176, 188, 198, 202, 211, 217, 227, 231, 246, 247 |
| DRB1*07011   | 148                          |   |
| DRB1*07012   | 148                          |   |
| DRB1*0703  | 148                          | 164, 169, 170, 177, 188, 198, 202, 211, 217, 227, 231, 247      |
| DRB1*0704  | 148                          | 164, 169, 170, 176, 188, 198, 202, 211, 217, 227, 230, 247      |
| DRB1*0801  | 146                          | 158, 199, 210, 222, 239, 246, 249                               |
| DRB1*08021   | 146                          | 158, 210, 222, 246, 249, 250                                    |
| DRB1*08022   | 146                          | 158, 210, 222, 246, 249, 250                                    |
| DRB1*08032   | 146                          | 158, 199, 211, 222, 246, 249                                    |
| DRB1*08041   | 146                          | 158, 210, 222, 234, 249, 250                                    |
| DRB1*08042   |                              | 158, 210, 222, 238, 239, 249, 250                               |
| DRB1*08043   | 146                          | 158, 210, 222, 238, 239, 249, 250                               |
| DRB1*0805  | 146                          | 158, 199, 210, 249  |
| DRB1*0806  | 146                          | 158, 199, 210, 222, 234, 249                                    |
| DRB1*0807  | 146                          | 158, 210, 222, 239, 246, 249, 250                               |
| DRB1*0808  | 146                          | 158, 200, 210, 222, 244, 249                                    |
| DRB1*0809  |                              | 168, 179, 188, 210, 222, 239, 246, 248, 250                     |
| DRB1*0810  | 146                          | 158, 199, 211, 222, 234, 249                                    |

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Table 13. (continued)

| Correspondence of DRB1 types and low accuracy and high accuracy typing capture oligos (9), alleles whose serological antigen type is DR7, DR8, DR9 or DR10 |                              |  |
|--|------------------------------|--|
| Type   | Corresponding capture oligos |  |
|  | low accuracy                 | high accuracy                                    |
| DRB1*0811  | 146                          | 158, 210, 222, 239, 246, 249, 250                |
| DRB1*0812  | 146                          | 158, 199, 211, 222, 249                          |
| DRB1*0813  | 146                          | 158, 222, 249, 250                               |
| DRB1*0814  | 146                          | 167, 199, 211 222, 2467, 249                     |
| DRB1*0815  | 146                          | 158203211222, 244, 246, 249                      |
| DRB1*0816  | 146                          | 158,185,199,210,222                              |
| DRB1*0817  | 146                          | 158, 194, 199, 210, 222, 249                     |
| DRB1*0818  | 146                          | 158, 199, 211, 246, 249                          |
| DRB1*0819  | 146                          | 58, 211 222, 246, 249, 250                       |
| DRB1*0820  | 146                          |  |
| DRB1*0821  | 146                          | 168, 179, 188, 210, 222, 239, 246, 248, 250      |
| DRB1*09012   | 150                          | 163, 169, 175, 184, 202, 210, 214, 223, 231, 243 |
| DRB1*10011   | 151                          |  |
| DRB1*10012   | 151                          |  |

Table 14.

| Correspondence of DRB3 types and low accuracy typing and high accuracy typing capture oligos |                              |   |
|--|------------------------------|---|
| Type   | Corresponding capture oligos |   |
|  | low accuracy                 | High accuracy   |
| DRB3*01011   | 152                          | 252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*01012   | 152                          | 252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*01013   | 152                          | 252, 255, 258, 260, 265, 268, 271, 273, 275, 277, 279 |
| DRB3*01014   | 152                          | 252, 255, 258, 260, 265, 267, 271, 273, 275, 278, 279 |
| DRB3*0102  | 153                          | 253, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*0103  | 152                          | 252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*0104  | 152                          | 252, 255, 258, 260, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*0105  | 152                          | 252, 256, 258, 260, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*0106  | 152                          | 252, 255, 258, 261, 265, 267, 271, 273, 275, 277, 279 |
| DRB3*0107  | 152                          | 252, 255, 258, 262, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*0201  | 154                          | 254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 280 |
| DRB3*02021   | 154                          | 254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*02022   | 154                          | 254, 257, 259, 262, 266, 269, 272, 274, 275, 277, 279 |
| DRB3*02023   | 154                          | 254, 257, 259, 262, 266, 269, 272, 273, 276, 277, 279 |
| DRB3*0203  | 154                          | 254, 257, 259, 263, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*0204  | 154                          | 254, 257, 259, 262, 266, 269, 271, 274, 275, 277, 280 |



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Table 14. (continued)

| Type      | Corresponding capture oligos |   |
|-----------|------------------------------|---|
|           | low accuracy                 | High accuracy   |
| DRB3*0205 | 154                          | 254, 257, 258, 262, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*0206 | 154                          | 254, 257, 259, 264, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*0207 | 154                          | 254, 257, 259, 262, 266, 267, 272, 273, 275, 277, 279 |
| DRB3*0208 | 154                          | 254, 257, 259, 262, 266, 270, 272, 273, 275, 277, 279 |
| DRB3*0210 | 154                          | 254, 257, 259, 262, 265, 269, 272, 273, 275, 277, 279 |
| DRB3*0211 | 154                          | 254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*0212 | 154                          | 254, 257, 259, 262, 266, 269, 272, 273, 275, 277, 279 |
| DRB3*0301 | 154                          | 254, 257, 258, 261, 265, 267, 272, 273, 275, 277, 280 |
| DRB3*0302 | 154                          | 254, 257, 259, 261, 265, 267, 272, 273, 275, 277, 280 |
| DRB3*0303 | 154                          | 254, 257, 258, 261, 265, 267, 271, 273, 275, 277, 279 |

Table 15.

| Type           | Corresponding capture oligos |                    |
|----------------|------------------------------|--------------------|
|                | low accuracy                 | high accuracy      |
| DRB4*01011     | 155                          | 281, 284, 286, 288 |
| DRB4*0102      |                              | 282, 284, 287      |
| DRB4*0103101   | 155                          | 281, 284, 287, 288 |
| DRB4*0103102 N |                              | 287                |
| DRB4*01032     | 155                          | 281, 284, 287, 289 |
| DRB4*0104      | 155                          | 283, 284           |
| DRB4*0105      | 155                          | 281, 285           |
| DRB4*0201N     | 155                          | 281, 284, 286      |
| DRB4*0301N     |                              | 286                |

Table 16.

| Type       | Corresponding capture oligos |                                   |
|------------|------------------------------|-----------------------------------|
|            | low accuracy                 | high accuracy                     |
| DRB5*01011 | 156                          | 290, 292, 295, 297, 302, 304, 306 |
| DRB5*01012 | 156                          | 290, 292, 295, 297, 300, 305, 306 |
| DRB5*0102  | 156                          | 291, 293, 295, 297, 302, 304, 306 |
| DRB5*0103  | 156                          | 291, 293, 295, 298, 304, 306      |
| DRB5*0104  | 156                          | 290, 292, 295, 297, 303, 306      |
| DRB5*0105  | 156                          | 290, 294, 295, 297, 302, 304, 306 |
| DRB5*0106  | 156                          | 290, 292, 296, 299, 301, 305, 307 |

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Table 16. (continued)

| Correspondence of DRB5 types and low accuracy typing and high accuracy typing capture oligos |                              |                                   |
|--|------------------------------|-----------------------------------|
| Type   | Corresponding capture oligos |                                   |
|  | low accuracy                 | high accuracy                     |
| DRB5*0107  | 156                          | 290, 292, 296, 297, 302, 305, 307 |
| DRB5*0108 N  | 156                          | 291, 293, 295, 297, 302, 304, 306 |
| DRB5*0109  | 156                          | 290, 292, 295, 297, 302, 304, 306 |
| DRB5*0110 N  | 156                          | 291, 293, 295, 297, 302, 304, 306 |
| DRB5*0202  | 156                          | 291, 293, 296, 299, 301, 305, 306 |
| DRB5*0203  | 156                          | 291, 293, 296, 299, 301, 305, 306 |
| DRB5*0204  | 156                          | 291, 293, 295, 299, 301, 305, 307 |

Table 17.

| Correspondence of DRB2, DRB6 and DRB7 types and low accuracy typing and high accuracy typing capture oligos |                              |                              |
|---|------------------------------|------------------------------|
| Type  | Corresponding capture oligos |                              |
|   | low accuracy                 | high accuracy                |
| DRB2*0101   |                              | 251                          |
| DRB6*0101   | 155                          | 308, 310, 312, 314, 316, 318 |
| DRB6*0201   | 155                          | 309, 311, 313, 315, 317, 319 |
| DRB6*0202   |                              | 309, 311, 313, 315, 317, 320 |
| DRB7*01011  |                              | 321                          |
| DRB7*01012  |                              | 322                          |
| DRB7*01011  | 155                          | 323                          |

Table 18.

| Correspondence of DPA types and high accuracy typing capture oligos |   |
|---|---|
| Type  | Corresponding capture oligos                          |
| DPA1*0103   | 324, 326, 330, 331, 333, 336, 338, 341, 343, 345, 347 |
| DPA1*0104   | 324, 326, 330, 331, 334, 336, 338, 341, 343, 345, 347 |
| DPA1*0105   | 324, 326, 330, 331, 333, 336, 338, 341, 343, 345, 348 |
| DPA1*0106   | 324, 326, 330, 331, 333, 337, 339, 341, 343, 345, 347 |
| DPA1*02011  | 324, 327, 330, 331, 333, 337, 339, 342, 343, 345, 348 |
| DPA1*02012  | 324, 326, 330, 331, 333, 337, 339, 342, 343, 345, 348 |
| DPA1*02013  | 324, 326, 330, 331, 333, 337, 338, 342, 343, 345      |
| DPA1*02014  | 324, 330, 331, 333, 337, 339, 342, 343, 345, 348      |
| DPA1*02021  | 325, 327, 329, 331, 333, 337, 340, 342, 343, 345, 348 |
| DPA1*02022  | 325, 327, 329, 331, 333, 337, 338, 342, 343, 345, 348 |
| DPA1*0203   | 324, 327, 330, 331, 333, 336, 338, 342, 343, 345, 347 |
| DPA1*0301   | 325, 327, 330, 331, 333, 336, 338, 341, 344, 345, 347 |
| DPA1*0302   | 325, 327, 330, 331, 333, 336, 338, 341, 343, 345, 347 |

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Table 18. (continued)

| Correspondence of DPA types and high accuracy typing capture oligos |   |
|---|---|
| Type  | Corresponding capture oligos                          |
| DPA1*0401   | 324, 326, 328, 332, 335, 336, 338, 342, 343, 346, 348 |

Table 19.

| Correspondence of DPB high accuracy typing capture (1) |  |
|--|--|
| Type   | Corresponding capture oligos   |
| DPB1*01011   | 349, 254, 358, 361, 366, 367, 376                                    |
| DPB1*01012   | 350, 355, 358, 364, 365, 368, 373, 376                               |
| DPB1*02011   | 350, 354, 358, 364, 365, 368, 373, 376                               |
| DPB1*02012   | 350, 354, 358, 364, 365, 369, 376                                    |
| DPB1*02013   | 350, 354, 358, 362, 365, 371, 376                                    |
| DPB1*0202  | 349, 356, 358, 364, 365, 370, 374, 377                               |
| DPB1*0301  | 350, 354, 358, 363, 365, 367, 376                                    |
| DPB1*0401  | 350, 354, 358, 364, 365, 368, 373, 376                               |
| DPB1*0402  | 350, 354, 358, 362, 365, 371, 376                                    |
| DPB1*0501  | 349, 356, 358, 364, 365, 370, 374, 377                               |
| DPB1*0601  | 350, 354, 358, 364, 365, 368, 373, 376                               |
| DPB1*0801  | 351, 356, 358, 364, 365, 370, 374, 376                               |
| DPB1*0901  | 351, 356, 358, 364, 365, 368, 373, 376, 386, 388, 390, 393, 396      |
| DPB1*1001  | 349, 356, 360, 361, 366, 367, 377, 384, 385, 388, 391, 393, 396      |
| DPB1*11011   | 349, 356, 359, 361, 366, 367, 377, 384, 386, 388, 391, 393, 396      |
| DPB1*11012   | 349, 356, 358, 361, 365, 367, 376, 386, 388, 392, 393, 396           |
| DPB1*1301  | 351, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*1401  | 349, 354, 360, 361, 366, 367, 377, 384, 386, 388, 391, 395, 396      |
| DPB1*1501  | 350, 354, 358, 364, 365, 368, 373, 376, 386, 388, 391, 393, 396      |
| DPB1*1601  | 351, 356, 358, 364, 365, 370, 374, 376, 386, 388, 391, 393, 396      |
| DPB1*1701  | 349, 354, 358, 364, 365, 368, 373, 376, 382, 386, 388, 391, 395, 396 |
| DPB1*1801  | 350, 354, 358, 364, 365, 371, 376, 386, 388, 392, 393, 396           |
| DPB1*1901  | 349, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 391, 393, 396 |
| DPB1*20011   | 349, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 391, 393, 396 |
| DPB1*20012   | 349, 356, 358, 362, 365, 371, 376, 386, 388, 391, 393, 396           |
| DPB1*2101  | 350, 354, 358, 362, 365, 371, 376, 386, 388, 391, 393, 396           |
| DPB1*2201  | 350, 354, 358, 364, 365, 367, 376, 382, 386, 388, 391, 394, 396      |
| DPB1*2301  | 350, 354, 358, 363, 365, 371, 376, 382, 386, 388, 391, 394, 396      |
| DPB1*2401  | 349, 356, 358, 364, 365, 368, 373, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*2501  | 349, 356, 358, 361, 366, 367, 376, 382, 386, 388, 393, 396           |
| DPB1*26011   | 349, 356, 358, 361, 365, 367, 376, 382, 386, 388, 390, 393, 396      |
| DPB1*26012   | 349, 356, 358, 361, 365, 367, 376, 382, 386, 388, 391, 393, 396      |

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Table 19. (continued)

| Correspondence of DPB high accuracy typing capture (1) |  |
|--|--|
| Type   | Corresponding capture oligos   |
| DPB1*2701  | 350, 354, 368, 363, 365, 368, 373, 377, 382, 386, 388, 391, 395, 396 |
| DPB1*2801  | 349, 356, 358, 364, 365, 370, 374, 377, 386, 388, 390, 393, 396      |
| DPB1*2901  | 351, 356, 358, 364, 365, 371, 376, 386, 388, 391, 393, 396           |
| DPB1*3001  | 350, 354, 358, 363, 365, 367, 377, 382, 387, 391, 393, 396           |
| DPB1*3101  | 350, 354, 358, 364, 365, 372, 375, 376, 386, 388, 391, 394, 396      |
| DPB1*3201  | 350, 354, 358, 363, 365, 367, 376, 386, 388, 391, 394, 396           |
| DPB1*3301  | 350, 354, 358, 362, 365, 367, 377, 382, 387, 391, 395, 396           |
| DPB1*3401  | 351, 356, 358, 364, 365, 370, 374, 376, 382, 386, 388, 390, 393, 396 |
| DPB1*3501  | 349, 356, 358, 362, 365, 371, 376, 382, 386, 388, 391, 393, 396      |
| DPB1*3601  | 349, 356, 358, 364, 365, 368, 373, 376, 386, 388, 390, 393, 396      |
| DPB1*3701  | 350, 354, 358, 362, 365, 371, 376, 382, 386, 388, 391, 393, 397      |
| DPB1*3801  | 350, 354, 358, 361, 365, 367, 376, 382, 386, 388, 391, 394, 396      |
| DPB1*3901  | 350, 354, 358, 361, 365, 367, 376, 382, 386, 388, 391, 395, 396      |
| DPB1*4001  | 350, 354, 358, 364, 365, 368, 373, 378, 386, 388, 391, 394, 396      |

Table 20.

| Correspondence of DPB types and high accuracy typing capture oligos (2) |  |
|---|--|
| Type  | Corresponding capture oligos   |
| DPB1*4101   | 349, 356, 358, 362, 365, 370, 374, 377, 386, 388, 390, 393, 396      |
| DPB1*4401   | 351, 356, 358, 364, 365, 368, 373, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*4501   | 350, 354, 358, 364, 365, 370, 374, 376, 386, 388, 391, 394, 396      |
| DPB1*4601   | 350, 354, 358, 364, 365, 371, 376, 386, 388, 391, 394, 396           |
| DPB1*4701   | 350, 354, 358, 362, 365, 368, 373, 376, 386, 388, 391, 394, 396      |
| DPB1*4801   | 350, 354, 358, 361, 365, 368, 373, 376, 382, 386, 388, 391, 394, 396 |
| DPB1*4901   | 349, 354, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*5001   | 350, 354, 358, 363, 365, 368, 373, 376, 382, 386, 388, 391, 394, 396 |
| DPB1*5101   | 349, 356, 358, 364, 365, 367, 377, 382, 386, 388, 390, 393, 396      |
| DPB1*5201   | 350, 354, 358, 361, 365, 368, 373, 376, 382, 386, 388, 391, 395, 396 |
| DPB1*5301   | 351, 356, 358, 364, 365, 371, 376, 386, 388, 390, 393, 396           |
| DPB1*5401   | 351, 356, 358, 364, 365, 367, 376, 386, 388, 391, 393, 396           |
| DPB1*5501   | 349, 356, 358, 363, 365, 367, 377, 382, 386, 388, 390, 393, 396      |
| DPB1*5601   | 350, 354, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*5701   | 351, 356, 358, 362, 365, 367, 376, 386, 388, 391, 393, 396           |
| DPB1*5801   | 350, 354, 358, 364, 365, 368, 373, 377, 382, 386, 388, 391, 394, 396 |
| DPB1*5901   | 350, 354, 358, 364, 365, 368, 373, 379, 382, 386, 388, 391, 394, 396 |
| DPB1*6001   | 349, 356, 358, 364, 365, 370, 374, 380, 381, 385, 386, 388, 390, 393 |
| DPB1*6101N  | 350, 354, 358, 362, 365, 367, 376, 382, 386, 388, 391, 395, 396      |

Table 20. (continued)

| Correspondence of DPB types and high accuracy typing capture oligos (2) |  |
|---|--|
| Type  | Corresponding capture oligos   |
| DPB1*6201   | 350, 354, 358, 362, 365, 367, 376, 382, 386, 388, 391, 393, 396      |
| DPB1*6301   | 352, 356, 358, 364, 365, 370, 374, 377, 386, 388, 391, 393, 396      |
| DPB1*6401N  | 350, 354, 358, 361, 365, 367, 376, 382, 386, 388, 390, 393, 396      |
| DPB1*6501   | 351, 356, 358, 363, 365, 367, 376, 382, 386, 388, 391, 394, 396      |
| DPB1*6601   | 351, 356, 358, 364, 365, 367, 377, 382, 386, 388, 390, 393, 396      |
| DPB1*6701   | 350, 354, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 393, 396 |
| DPB1*6801   | 349, 356, 358, 364, 365, 370, 374, 377, 384, 386, 388, 391, 393, 396 |
| DPB1*6901   | 353, 356, 358, 364, 365, 370, 374, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*7001   | 350, 354, 358, 364, 365, 367, 376, 386, 388, 391, 394, 396           |
| DPB1*7101   | 350, 354, 358, 363, 365, 367, 377, 382, 386, 388, 391, 394, 396      |
| DPB1*7201   | 350, 354, 358, 364, 365, 368, 373, 377, 382, 386, 388, 390, 394, 396 |
| DPB1*7301   | 349, 356, 359, 364, 366, 367, 377, 386, 388, 391, 395, 396           |
| DPB1*7401   | 350, 354, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 394, 396 |
| DPB1*7501   | 351, 356, 358, 363, 365, 368, 373, 377, 382, 386, 388, 390, 393, 396 |
| DPB1*7601   | 350, 357, 358, 361, 365, 368, 373, 376, 382, 386, 388, 391, 394, 396 |
| DPB1*7701   | 349, 356, 358, 364, 365, 370, 374, 377, 382, 389, 390, 393, 396      |
| DPB1*7801   | 349, 356, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 393, 396 |
| DPB1*7901   | 349, 356, 358, 364, 365, 368, 373, 376, 382, 386, 388, 390, 393, 396 |

**[0068]** The kit of the present invention includes a substrate on which capture oligos are immobilized. The kit of the present invention can include primers for preparing a nucleic acid target or reagents for hybridization such as a labeled nucleic acid target, buffer and enzyme conjugate recognizing a hapten.

#### Brief Description of the Drawings

#### **[0069]**

Fig. 1 shows positions of capture oligos (for HLA-DQA1) immobilized on a substrate. Numbers in the figure represent sequence numbers (the same shall apply in Figs. 2-7).

Fig. 2 shows positions of capture oligos (for HLA-DQB1) immobilized on a substrate.

Fig. 3 shows positions of capture oligos (for HLA-DRA) immobilized on a substrate.

Fig. 4 shows positions of capture oligos (for HLA-DRB1) immobilized on a substrate.

Fig. 5 shows positions of capture oligos (for HLA-DRB3, HLA-DRB4, HLA-DRB5 and HLA-DRB6) immobilized on a substrate.

Fig. 6 shows positions of capture oligos (for HLA-DPA1) immobilized on a substrate.

Fig. 7 shows positions of capture oligos (for HLA-DPB1) immobilized on a substrate.

Fig. 8 shows a schematic view of a kit of the present invention and a detection result of DRA typing using the same (detection result typed as DRA\*0101).

**[0070]** Numbers in the figure represent sequence numbers. B indicates that an oligonucleotide in which biotin is introduced at 5' end is immobilized, indicates that hybridization is not obtained. indicates that a hybridization signal is obtained (the same shall apply in Figs. 9 and 10).

Fig. 9 shows a schematic view of the kit of the present invention and a detection result of DRB low resolution typing using the same (detection result typed as DR4).

Fig. 10 shows a schematic view of the kit of the present invention and a detection result of DRB1 high resolution typing using the same (detection result typed as DRB\*04011).

Fig. 11 shows positions of capture oligos (for HLA-DPB1) immobilized on a substrate.

Fig. 12 shows positions of capture oligos (for HLA-DQB1) immobilized on a substrate.

Fig. 13 shows positions of capture oligos (for HLA-DRB1) immobilized on a substrate.

Fig. 14 shows positions of capture oligos (for HLA-DRB pseudogene) immobilized on a substrate.

Fig. 15 shows positions of capture oligos (for HLA-DPB3, 4, 5) immobilized on a substrate.

Fig. 16 shows positions of capture oligos (for HLA-A) immobilized on a substrate.

Fig. 17 shows positions of capture oligos (for HLA-B) immobilized on a substrate.

Fig. 18 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DPB1 typing using the same (detection result typed as DPB1\*01011) (B).

Fig. 19 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DQB1 typing using the same (detection result typed as DQB1\*05031) (B).

Fig. 20 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DRB1 typing using the same (detection result typed as DRB1\*0101) (B).

Fig. 21 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DRB9 typing using the same (detection result typed as DRB9 0101) (B).

Fig. 22 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of DRB3 typing using the same (detection result typed as DRB3 0301) (B).

Fig. 23 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of A typing using the same (detection result typed as A 01011) (B).

Fig. 24 shows a schematic view of the kit of the present invention (A) and a photograph showing detection result of B typing using the same (detection result typed as B 0724) (B).

## Best Mode for Carrying out the Invention

**[0071]** Hereafter, the present invention will be explained more specifically with reference to the following examples.

### Example 1. Synthesis of oligonucleotides

**[0072]** According to a usual method, oligonucleotides having an amino group or hydroxyl group at 5' end were synthesized by using an oligonucleotide synthesizer (Perkin-Elmer Applied Biosystems), deprotected and dried. These dried oligonucleotides were dissolved in a buffer of 10 mM Tris-HCl (pH 7.5) and 1 mM EDTA to prepare 100 pmol/μL solutions of oligonucleotides. This synthesis method can be employed both for oligonucleotides used as capture oligos and those used as primers. The nucleotide sequences of the synthesized oligonucleotides are listed in Sequence Listing as SEQ ID NOS: 1-447. Among these, SEQ ID NOS: 1-397 are capture oligos and SEQ ID NOS: 398-447 are primers.

### Example 2. Spotting of capture oligos on substrate (utilizing oligonucleotide having amino group at 5' end)

**[0073]** In an amount of 10 μL of a microspotting solution (TeleChem International Inc.) was mixed with 10 μL of a solution of oligonucleotide having an amino group at 5' end and added onto a microtiter plate (Greiner Laboratory Inc.). Silanized slide glass (Matsunami Glass Ind. Ltd.) was placed at a predetermined position in a spotting machine and then the spotting machine was operated. After the spotting was completed, the slide glass was exposed to vapor from hot water for a few seconds and then irradiated with ultraviolet ray of 30 mJ. After exposed to vapor again for a few seconds, the slide glass was placed on a hot plate to remove moisture. The slide glass was rinsed with 0.1% sodium dodecyl sulfate aqueous solution and then with distilled water. The slide glass was blocked by immersing it in 100 mM Tris-HCl (pH 7.5), 100 mM NaCl and 0.1% Triton X-100 containing 3% bovine serum albumin (BSA) at room temperature for 30 minutes. Then, after dried at room temperature, the slide glass was washed with a buffer of 10 mM Tris-HCl (pH 7.5) and 1 mM EDTA. The slide glass was dried at room temperature again and maintained in a dry state in a dark cold place until use.

### Example 3. Spotting of capture oligos on substrate (utilizing oligonucleotide having hydroxyl group at 5' end)

**[0074]** In an amount of 10 μL of a microspotting solution (2 M sodium chloride aqueous solution) was mixed with 10 μL of a solution of oligonucleotide having a hydroxyl group at 5' end and added onto a microtiter plate (Greiner Laboratory Inc.). Silanized slide glass (Matsunami Glass Ind. Ltd.) was placed at a predetermined position in a spotting machine and then the spotting machine was operated. After the spotting was completed, the slide glass was placed

in a drier at 37°C for 30 minutes. The slide glass was blocked by immersing it in 100 mM Tris-HCl (pH 7.5), 100 mM NaCl and 0.1% Triton X-100 containing 3% bovine serum albumin (BSA) at room temperature for 30 minutes. Then, after dried at room temperature, the slide glass was washed with a buffer of 10 mM Tris-HCl (pH 7.5) and 1 mM EDTA. The slide glass was dried at room temperature again and maintained in a dry state in a dark cold place until use.

#### Example 4. Preparation of nucleic acid target

**[0075]** Nucleated cells were collected from peripheral blood, cultured cells or the like, placed in a microtube and washed 3 times with physiological saline. The cells were added and mixed with 800 µl of 0.1 M Tris-HCl (pH 8.0), 0.2 M NaCl, 0.04 M EDTA and 2% SDS, then added with 120 µg of proteinase K and incubated overnight at 50°C. The mixture was added with 800 µl of 1 M Tris-HCl saturated phenol was added and rotated on a rotator for 1 hour or longer, and extracted 3 times with phenol to remove proteins. The aqueous layer was added with 2 ml of 2-propanol and 60 µl of 5 M NaCl and gently mixed, and then the precipitated DNA was quickly sucked up with a micropipette. The DNA was washed 3 times by centrifugation with addition of 70% cold ethanol. The DNA was dried under reduced pressure and dissolved in 70 µl of sterilized water to prepare a PCR template solution.

**[0076]** The composition for PCR amplification consisted of 2 units of Taq polymerase, 25 pmol each of primers, 5 µl of reaction buffer, 10 nmol each of dNTP, 0.5 µl of template DNA solution and sterilized water giving a total volume of 50 µl. The solution placed in a tube was set on a thermal cycler. A program was operated such that, out of a cycle of (1) 95°C, 3 minutes, (2) 95°C, 30 seconds, (3) 71°C, 30 seconds and (4) 72°C, 3 minutes, (2) and (3) should be repeated 30 times.

**[0077]** In this example, agarose gel electrophoresis described below was performed as a confirmation test, but is not required in identification in an actual clinical case. In an amount of 1 µl of the PCR reaction mixture was taken and mixed with 1 µl of 6 x migration pigment (30% glycerol, 0.25% Bromophenol Blue, 0.25% xylene cyanol) and 4 µl of distilled water. After electrophoresis was performed on 2% agarose gel for 90 minutes at 100 V, the gel was immersed in distilled water containing 0.5 µg/ml of ethidium bromide for 30 minutes and photographed under ultraviolet ray irradiation by using a CCD camera.

#### Example 5. Hybridization

**[0078]** In an amount of 2 µl of the nucleic acid target prepared in Example 4 was taken and mixed with 8 µl of ArrayIt Unihyb Hybridization Solution (TeleChem International Inc.), subjected to a heat treatment at 100°C for 10 minutes, and then immersed in ice for 5 minutes. In an amount of 5 µl of this nucleic acid target solution was taken and placed on a substrate on which the capture oligos prepared in Example 2 or 3 were immobilized and then cover glass was placed thereon. This substrate was placed in a moisture box, further placed in an incubator set at 42°C and left for 60 minutes. The substrate was taken out from the incubator and quickly immersed in 5 x SSC (0.083 M NaCl and 0.083 M sodium citrate) at 4°C to remove the cover glass. Immersion of the substrate in 5 x SSC at 4°C for 10 minutes was repeated twice and then the substrate was rinsed twice with 3 M tetramethylammonium chloride aqueous solution at room temperature. Immersion of the substrate in 3 M tetramethylammonium chloride aqueous solution at 45°C for 20 minutes was repeated twice. Finally, the substrate was immersed in 2 x SSC (0.033 M NaCl and 0.033 M sodium citrate).

#### Example 6. Detection of chemical color development

**[0079]** After hybridization was completed in Example 5, the substrate was taken out from 2 x SSC. Block Ace (Dainippon Pharmaceutical Co., Ltd.) stock solution (4% aqueous solution) was placed on the substrate in an amount of 70 µl per cm<sup>2</sup> and left at room temperature for 20 minutes, and then the solution was removed. Subsequently, a mixed solution obtained by adding 2 drops each of avidin DH (Vector Laboratories, Inc.) and biotinylated horseradish peroxidase H (Vector Laboratories, Inc.) to 5 ml of TBST (0.05 M Tris-HCl (pH 7.6), 0.15 M NaCl, 0.05% Tween 20) and mixing them was placed on the substrate in an amount of 70 µl per cm<sup>2</sup> and left at room temperature for 30 minutes, and then the solution was removed. After immersion of the substrate in TBST at room temperature for 5 minutes was repeated twice, the substrate was taken out from the buffer and the moisture was sufficiently removed with paper towel. A TMB (3,3',5,5'-tetramethylbenzidine) color development substrate kit (Vector Laboratories, Inc.) was placed on the substrate in amount of 70 µl per cm<sup>2</sup> and left at room temperature for 10 minutes, and then the solution was removed. The substrate was immersed in deionized water to stop the enzymatic reaction.

**[0080]** The results of the above examples are shown in Figs. 8-10. It is evident that HLA typing can be carried out by the method of the present invention.

**[0081]** According to the present invention, there are provided a kit and method that enable multiple specimen processing and a highly precise HLA typing with one time of test as well as oligonucleotides and primers for use in the same.

Example 7. Typing using Patchworks

**[0082]** Oligonucleotides used for preparation of arrays were synthesized in a similar manner as Example 1. Arrays were prepared in a similar manner as Example 2 or 3.

5 Correspondence of the sequences of oligonucleotides used in arrays for typing HLA and HLA types are shown in Tables 21-32. For amplifying targets, combinations of primers shown in Table 33 were used. Typing was performed in a similar manner as Examples 4-6.

**[0083]** The results are shown in Figs. 18-24. Thus, HLA typing of the test specimen can be performed with the arrays which were prepared using oligonucleotides designed according to patchworks and satellites.

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Table 21

| Correspondence of the patchwork regions and satellite regions for types of DPB1 |                  |      |      |       |       |       |       |                  |     |  |  |     |
|---|------------------|------|------|-------|-------|-------|-------|------------------|-----|--|--|-----|
|   | patchwork region |      |      |       |       |       |       | satellite region |     |  |  |     |
|   | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB18 | DPB21 |                  |     |  |  |     |
| DPB1#01011  | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB18 | DPB21 |                  |     |  |  |     |
| DPB1#6501   | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB18 | DPB21 |                  |     |  |  |     |
| DPB1#01012  | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB18 | DPB21 | 473              |     |  |  |     |
| DPB1#8901   | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB19 | DPB21 |                  |     |  |  |     |
| DPB1#1301   | DPB2             | DPB4 | DPB7 | DPB12 | DPB16 | DPB20 | DPB21 |                  |     |  |  |     |
| DPB1#26011  | DPB2             | DPB4 | DPB7 | DPB12 | DPB15 | DPB18 | DPB21 | 473              | 495 |  |  |     |
| DPB1#26012  | DPB2             | DPB4 | DPB7 | DPB12 | DPB15 | DPB18 | DPB21 |                  |     |  |  |     |
| DPB1#2701   | DPB2             | DPB4 | DPB7 | DPB12 | DPB15 | DPB19 | DPB21 |                  |     |  |  |     |
| DPB1#8501   | DPB2             | DPB4 | DPB7 | DPB12 | DPB15 | DPB19 | DPB21 |                  |     |  |  | 456 |
| DPB1#3901   | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB19 | DPB22 |                  |     |  |  |     |
| DPB1#4001   | DPB1             | DPB4 | DPB7 | DPB12 | DPB15 | DPB19 | DPB23 |                  |     |  |  |     |
| DPB1#0401   | DPB1             | DPB3 | DPB7 | DPB12 | DPB15 | DPB19 | DPB22 |                  |     |  |  |     |
| DPB1#3301   | DPB1             | DPB3 | DPB7 | DPB12 | DPB16 | DPB19 | DPB22 |                  |     |  |  |     |
| DPB1#6601   | DPB2             | DPB3 | DPB7 | DPB12 | DPB15 | DPB19 | DPB22 |                  |     |  |  | 456 |
| DPB1#2301   | DPB1             | DPB5 | DPB7 | DPB12 | DPB15 | DPB19 | DPB22 |                  |     |  |  |     |
| DPB1#7101   | DPB1             | DPB5 | DPB7 | DPB12 | DPB16 | DPB19 | DPB22 |                  |     |  |  |     |
| DPB1#5501   | DPB2             | DPB5 | DPB7 | DPB12 | DPB16 | DPB19 | DPB21 |                  |     |  |  | 456 |
| DPB1#5801   | DPB2             | DPB6 | DPB7 | DPB12 | DPB16 | DPB19 | DPB21 |                  |     |  |  | 456 |
| DPB1#6301   | DPB1             | DPB6 | DPB7 | DPB12 | DPB15 | DPB19 | DPB21 |                  |     |  |  |     |
| DPB1#6201   | DPB1             | DPB6 | DPB7 | DPB12 | DPB15 | DPB19 | DPB23 |                  |     |  |  |     |
| DPB1#1601   | DPB1             | DPB4 | DPB8 | DPB12 | DPB16 | DPB19 | DPB21 |                  |     |  |  |     |
| DPB1#4901   | DPB1             | DPB4 | DPB8 | DPB12 | DPB15 | DPB19 | DPB22 |                  |     |  |  |     |
| DPB1#5301   | DPB1             | DPB4 | DPB8 | DPB12 | DPB15 | DPB19 | DPB23 |                  |     |  |  |     |
| DPB1#0801   | DPB1             | DPB5 | DPB8 | DPB12 | DPB16 | DPB18 | DPB21 |                  |     |  |  |     |

Table 21 (continued)

| Correspondence of the patchwork regions and satellite regions for types of DPB1 |                  |      |       |       |       |       |                  |     |  |  |  |     |
|---|------------------|------|-------|-------|-------|-------|------------------|-----|--|--|--|-----|
|   | patchwork region |      |       |       |       |       | satellite region |     |  |  |  |     |
|   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB18 | DPB21            |     |  |  |  |     |
| DPB1†6801   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB18 | DPB21            |     |  |  |  |     |
| DPB1†7501   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB18 | DPB22            |     |  |  |  |     |
| DPB1†02012  | DPB1             | DPB5 | DPB8  | DPB12 | DPB16 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†3201   | DPB1             | DPB5 | DPB8  | DPB12 | DPB16 | DPB19 | DPB22            | 481 |  |  |  |     |
| DPB1†4601   | DPB1             | DPB5 | DPB8  | DPB12 | DPB16 | DPB19 | DPB22            | 482 |  |  |  |     |
| DPB1†6001   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB19 | DPB22            | 487 |  |  |  |     |
| DPB1†7701   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB19 | DPB22            | 464 |  |  |  |     |
| DPB1†8001   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†8201   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†0901   | DPB2             | DPB5 | DPB8  | DPB12 | DPB16 | DPB18 | DPB21            | 482 |  |  |  | 456 |
| DPB1†1001   | DPB2             | DPB5 | DPB8  | DPB12 | DPB16 | DPB18 | DPB21            |     |  |  |  | 456 |
| DPB1†3701   | DPB2             | DPB5 | DPB8  | DPB12 | DPB16 | DPB18 | DPB21            |     |  |  |  |     |
| DPB1†3501   | DPB2             | DPB5 | DPB8  | DPB12 | DPB15 | DPB18 | DPB21            | 482 |  |  |  | 456 |
| DPB1†7901   | DPB2             | DPB5 | DPB8  | DPB12 | DPB15 | DPB18 | DPB21            |     |  |  |  |     |
| DPB1†8801   | DPB2             | DPB5 | DPB8  | DPB12 | DPB16 | DPB18 | DPB21            | 482 |  |  |  |     |
| DPB1†1701   | DPB2             | DPB5 | DPB8  | DPB12 | DPB16 | DPB19 | DPB21            | 482 |  |  |  | 456 |
| DPB1†0402   | DPB2             | DPB5 | DPB8  | DPB12 | DPB15 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†1801   | DPB1             | DPB5 | DPB8  | DPB12 | DPB15 | DPB19 | DPB23            |     |  |  |  |     |
| DPB1†4801   | DPB1             | DPB6 | DPB8  | DPB12 | DPB16 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†5101   | DPB1             | DPB3 | DPB8  | DPB12 | DPB15 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†8101   | DPB1             | DPB3 | DPB8  | DPB12 | DPB16 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†02013  | DPB1             | DPB5 | DPB9  | DPB12 | DPB16 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†4701   | DPB1             | DPB5 | DPB10 | DPB12 | DPB16 | DPB19 | DPB22            |     |  |  |  |     |
| DPB1†1901   | DPB1             | DPB5 | DPB10 | DPB12 | DPB16 | DPB20 | DPB21            |     |  |  |  |     |

Table 21 (continued)

| Correspondence of the patchwork regions and satellite regions for types of DPB1 |                  |      |       |       |       |       |       |     |                  |     |  |     |
|---|------------------|------|-------|-------|-------|-------|-------|-----|------------------|-----|--|-----|
|   | patchwork region |      |       |       |       |       |       |     | satellite region |     |  |     |
|   | DPB2             | DPB5 | DPB10 | DPB12 | DPB16 | DPB19 | DPB21 |     |                  |     |  |     |
| DPB1#3001   | DPB2             | DPB5 | DPB10 | DPB12 | DPB16 | DPB19 | DPB21 |     |                  |     |  | 456 |
| DPB1#5401   | DPB2             | DPB5 | DPB10 | DPB12 | DPB16 | DPB18 | DPB21 |     |                  |     |  | 456 |
| DPB1#0202   | DPB1             | DPB6 | DPB10 | DPB12 | DPB16 | DPB19 | DPB22 |     |                  |     |  |     |
| DPB1#2201   | DPB1             | DPB6 | DPB10 | DPB12 | DPB16 | DPB19 | DPB21 |     |                  |     |  |     |
| DPB1#0501   | DPB1             | DPB6 | DPB10 | DPB12 | DPB15 | DPB19 | DPB21 |     |                  |     |  |     |
| DPB1#3801   | DPB1             | DPB6 | DPB10 | DPB12 | DPB15 | DPB19 | DPB21 | 465 |                  |     |  |     |
| DPB1#2101   | DPB2             | DPB6 | DPB10 | DPB12 | DPB16 | DPB19 | DPB21 |     |                  |     |  |     |
| DPB1#3601   | DPB2             | DPB6 | DPB10 | DPB12 | DPB15 | DPB19 | DPB21 |     |                  |     |  |     |
| DPB1#2401   | DPB1             | DPB3 | DPB10 | DPB12 | DPB15 | DPB19 | DPB22 |     |                  |     |  |     |
| DPB1#8401   | DPB1             | DPB5 | DPB11 | DPB12 | DPB15 | DPB18 | DPB22 |     |                  |     |  |     |
| DPB1#11011  | DPB2             | DPB4 | DPB7  | DPB13 | DPB17 | DPB19 | DPB21 | 467 | 473              |     |  |     |
| DPB1#11012  | DPB2             | DPB4 | DPB7  | DPB13 | DPB17 | DPB19 | DPB21 | 466 | 467              | 473 |  |     |
| DPB1#1501   | DPB1             | DPB4 | DPB7  | DPB13 | DPB17 | DPB19 | DPB23 | 467 | 473              |     |  |     |
| DPB1#7401   | DPB2             | DPB4 | DPB7  | DPB13 | DPB17 | DPB19 | DPB23 | 467 | 473              |     |  |     |
| DPB1#3101   | DPB1             | DPB3 | DPB7  | DPB13 | DPB15 | DPB19 | DPB21 |     |                  |     |  |     |
| DPB1#5601   | DPB2             | DPB3 | DPB7  | DPB13 | DPB15 | DPB18 | DPB21 |     |                  |     |  |     |
| DPB1#7201   | DPB1             | DPB3 | DPB7  | DPB13 | DPB15 | DPB19 | DPB22 |     |                  |     |  |     |
| DPB1#3401   | DPB1             | DPB6 | DPB7  | DPB13 | DPB15 | DPB19 | DPB23 | 493 |                  |     |  |     |
| DPB1#5201   | DPB2             | DPB5 | DPB7  | DPB13 | DPB15 | DPB18 | DPB21 |     |                  |     |  |     |
| DPB1#03012  | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482 | 503              |     |  |     |
| DPB1#1401   | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482 |                  |     |  | 456 |
| DPB1#6101N  | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB2  | 482 |                  |     |  |     |
| DPB1#7001   | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482 |                  |     |  | 457 |
| DPB1#2501   | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 |     |                  |     |  |     |

Table 21 (continued)

| Correspondence of the patchwork regions and satellite regions for types of DPB1 |                  |      |       |       |       |       |       |                  |  |  |     |
|---|------------------|------|-------|-------|-------|-------|-------|------------------|--|--|-----|
|   | patchwork region |      |       |       |       |       |       | satellite region |  |  |     |
|   | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 |                  |  |  |     |
| DPB1#4501   | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 |                  |  |  | 456 |
| DPB1#6701   | DPB2             | DPB5 | DPB7  | DPB13 | DPB15 | DPB18 | DPB21 |                  |  |  | 456 |
| DPB1#7801   | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482              |  |  |     |
| DPB1#2901   | DPB2             | DPB5 | DPB8  | DPB13 | DPB16 | DPB18 | DPB21 | 482              |  |  |     |
| DPB1#0601   | DPB2             | DPB5 | DPB8  | DPB13 | DPB16 | DPB19 | DPB21 | 482              |  |  |     |
| DPB1#20011  | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB19 | DPB21 | 482              |  |  |     |
| DPB1#20012  | DPB2             | DPB5 | DPB8  | DPB13 | DPB15 | DPB19 | DPB21 | 482              |  |  |     |
| DPB1#6401N  | DPB2             | DPB5 | DPB8  | DPB13 | DPB16 | DPB19 | DPB21 |                  |  |  |     |
| DPB1#6901   | DPB2             | DPB5 | DPB8  | DPB13 | DPB17 | DPB19 | DPB21 | 482              |  |  |     |
| DPB1*5001   | DPB1             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482              |  |  |     |
| DPB1#5701   | DPB1             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482              |  |  |     |
| DPB1#5901   | DPB1             | DPB5 | DPB8  | DPB13 | DPB15 | DPB19 | DPB22 |                  |  |  |     |
| DPB1#7301   | DPB1             | DPB5 | DPB8  | DPB13 | DPB15 | DPB18 | DPB22 |                  |  |  |     |
| DPB1#8701   | DPB2             | DPB5 | DPB7  | DPB13 | DPB15 | DPB19 | DPB22 |                  |  |  |     |
| DPB1#2801   | DPB1             | DPB3 | DPB8  | DPB13 | DPB15 | DPB19 | DPB23 |                  |  |  |     |
| DPB1#7601   | DPB2             | DPB3 | DPB8  | DPB13 | DPB15 | DPB18 | DPB21 | 482              |  |  | 456 |
| DPB1#4401   | DPB2             | DPB6 | DPB8  | DPB13 | DPB16 | DPB18 | DPB21 | 482              |  |  |     |
| DPB1#03011  | DPB2             | DPB5 | DPB10 | DPB13 | DPB15 | DPB18 | DPB21 | 482              |  |  |     |
| DPB1#4101   | DPB1             | DPB5 | DPB8  | DPB14 | DPB16 | DPB19 | DPB22 |                  |  |  |     |
| DPB1#8301   | DPB1             | DPB5 | DPB8  | DPB14 | DPB15 | DPB19 | DPB22 |                  |  |  |     |
| DPB1#8601   | DPB2             | DPB5 | DPB8  | DPB9  | DPB16 | DPB19 | DPB22 | 482              |  |  |     |

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Table 22.

| Correspondence of Patchwork DPB1 and SEQ ID NOS. for DPB1 |             |     |     |
|---|-------------|-----|-----|
| Patchwork   | SEQ ID NOS. |     |     |
| F   | 458         | 460 | 462 |
| DPB2  | 459         | 461 | 463 |
| DPB3  | 468         |     |     |
| DPB4  | 469         | 472 |     |
| DPB5  | 470         |     |     |
| DPB6  | 471         |     |     |
| DPB7  | 474         |     |     |
| DPB8  | 475         | 479 | 480 |
| DPB9  | 476         |     |     |
| DPB10   | 477         |     |     |
| DPB11   | 478         |     |     |
| DPB12   | 483         |     |     |
| DPB13   | 484         | 486 |     |
| DPB14   | 485         |     |     |
| DPB15   | 489         | 92  |     |
| DPB16   | 490         |     |     |
| DPB17   | 491         |     |     |
| DPB18   | 496         | 498 |     |
| DPB19   | 497         |     |     |
| DPB20   | 499         |     |     |
| DPB21   | 500         |     |     |
| DPB22   | 501         |     |     |
| DPB23   | 502         |     |     |

|            |      | patchwork region |       |       |       |       |       |       |       |       |       | satellite region |     |     |     |     |     |     |     |  |  |
|------------|------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|-----|-----|-----|-----|-----|-----|-----|--|--|
|            |      |                  |       |       |       |       |       |       |       |       |       |                  |     |     |     |     |     |     |     |  |  |
| QDB1*0201  | QDB1 | QDB5             | QDB8  | QDB10 | QDB15 | QDB19 | QDB23 | QDB26 | QDB30 | QDB34 |       | 514              | 525 | 527 | 539 | 549 | 552 | 553 | 581 |  |  |
| QDB1*0202  | QDB1 | QDB5             | QDB8  | QDB10 | QDB15 | QDB19 | QDB23 | QDB26 | QDB30 | QDB34 |       | 514              | 525 | 527 | 539 | 549 | 552 | 553 | 581 |  |  |
| QDB1*0203  | QDB1 | QDB5             | QDB8  | QDB10 | QDB15 | QDB19 | QDB23 | QDB26 | QDB30 | QDB34 | QDB35 | 514              | 525 | 527 | 539 | 549 | 552 | 553 | 581 |  |  |
| QDB1*05031 | QDB1 | QDB4             | QDB7  | QDB10 | QDB14 | QDB18 | QDB22 | QDB26 | QDB30 |       |       | 549              | 584 |     |     |     |     |     |     |  |  |
| QDB1*05032 | QDB1 | QDB5             | QDB8  | QDB11 | QDB14 | QDB18 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 549 | 553 | 582 | 583 |     |     |     |  |  |
| QDB1*0310  | QDB1 | QDB6             | QDB9  | QDB11 | QDB14 | QDB18 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 549 | 582 | 583 |     |     |     |     |  |  |
| QDB1*03033 | QDB1 | QDB5             | QDB8  | QDB12 | QDB14 | QDB18 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 553 | 582 | 583 |     |     |     |     |  |  |
| QDB1*06011 | QDB3 | QDB6             | QDB9  | QDB10 | QDB14 | QDB18 | QDB23 | QDB27 | QDB31 |       |       | 513              | 526 | 530 | 549 | 580 | 582 | 583 |     |  |  |
| QDB1*06013 | QDB6 | QDB9             | QDB10 | QDB14 | QDB18 | QDB23 | QDB27 | QDB31 |       |       |       | 513              | 526 | 530 | 549 | 580 | 582 | 583 |     |  |  |
| QDB1*06012 | QDB3 | QDB6             | QDB9  | QDB10 | QDB14 | QDB18 | QDB23 | QDB27 | QDB31 |       |       | 526              | 530 | 549 | 551 | 580 | 582 | 583 |     |  |  |
| QDB1*0306  | QDB1 | QDB5             | QDB8  | QDB11 | QDB14 | QDB18 | QDB23 | QDB25 | QDB30 | QDB35 |       | 515              | 526 | 549 | 553 | 571 | 582 | 583 |     |  |  |
| QDB1*0401  | QDB2 | QDB5             | QDB7  | QDB12 | QDB14 | QDB18 | QDB23 | QDB25 | QDB30 |       |       | 515              | 516 | 526 | 549 | 553 | 556 | 571 | 585 |  |  |
| QDB1*0402  | QDB2 | QDB5             | QDB7  | QDB12 | QDB14 | QDB18 | QDB23 | QDB25 | QDB30 |       |       | 515              | 526 | 549 | 553 | 556 | 571 | 585 |     |  |  |
| QDB1*05032 | QDB7 | QDB10            | QDB14 | QDB20 | QDB22 |       |       |       |       |       |       | 549              |     |     |     |     |     |     |     |  |  |
| QDB1*0302  | QDB1 | QDB5             | QDB8  | QDB11 | QDB14 | QDB19 | QDB22 | QDB27 | QDB30 | QDB33 |       | 526              | 549 | 553 | 582 | 583 |     |     |     |  |  |
| QDB1*0307  | QDB1 | QDB5             | QDB8  | QDB11 | QDB14 | QDB19 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 550 | 553 | 582 | 583 |     |     |     |  |  |
| QDB1*0308  | QDB1 | QDB5             | QDB8  | QDB11 | QDB14 | QDB19 | QDB22 | QDB28 | QDB30 | QDB35 |       | 526              | 549 | 553 | 582 | 583 |     |     |     |  |  |
| QDB1*0305  | QDB1 | QDB5             | QDB7  | QDB12 | QDB14 | QDB19 | QDB22 | QDB27 | QDB30 | QDB35 |       | 515              | 526 | 549 | 553 | 582 | 583 |     |     |  |  |
| QDB1*0309  | QDB1 | QDB6             | QDB9  | QDB11 | QDB13 | QDB18 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 538 | 549 | 553 | 582 | 583 |     |     |  |  |
| QDB1*03011 | QDB1 | QDB6             | QDB9  | QDB11 | QDB13 | QDB18 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 538 | 549 | 553 | 582 | 583 |     |     |  |  |
| QDB1*03012 | QDB1 | QDB6             | QDB9  | QDB12 | QDB13 | QDB18 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 538 | 549 | 553 | 582 | 583 |     |     |  |  |
| QDB1*05011 | QDB1 | QDB4             | QDB7  | QDB10 | QDB13 | QDB16 | QDB22 | QDB24 | QDB29 |       |       | 549              | 584 |     |     |     |     |     |     |  |  |
| QDB1*05012 | QDB1 | QDB4             | QDB7  | QDB10 | QDB13 | QDB16 | QDB22 | QDB24 | QDB29 |       |       | 524              | 549 | 582 | 583 |     |     |     |     |  |  |
| QDB1*06041 | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB24 | QDB32 |       |       | 524              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*06042 | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB24 | QDB32 |       |       | 524              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0606  | QDB1 | QDB4             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB27 |       |       |       | 524              | 526 | 549 | 581 |     |     |     |     |  |  |
| QDB1*0609  | QDB8 | QDB12            | QDB13 | QDB16 | QDB22 | QDB27 | QDB32 |       |       |       |       | 524              | 526 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*06051 | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB27 | QDB32 |       |       | 524              | 526 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0608  | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB28 | QDB31 |       |       | 524              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0613  | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB28 | QDB31 |       |       | 526              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0612  | QDB2 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB28 | QDB32 |       |       | 524              | 526 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0617  | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB16 | QDB22 | QDB24 | QDB32 |       |       | 524              | 549 | 582 | 583 |     |     |     |     |  |  |
| QDB1*0502  | QDB1 | QDB4             | QDB7  | QDB10 | QDB13 | QDB17 | QDB22 | QDB24 | QDB29 |       |       | 549              | 584 |     |     |     |     |     |     |  |  |
| QDB1*0504  | QDB1 | QDB4             | QDB7  | QDB10 | QDB13 | QDB17 | QDB23 | QDB25 | QDB33 |       |       | 526              | 549 |     |     |     |     |     |     |  |  |
| QDB1*0610  | QDB2 | QDB5             | QDB8  | QDB12 | QDB13 | QDB17 | QDB22 | QDB28 | QDB31 |       |       | 526              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0611  | QDB2 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB28 | QDB31 |       |       | 526              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*06112 | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB28 | QDB31 |       |       | 524              | 526 | 548 | 549 | 582 | 583 |     |     |  |  |
| QDB1*0603  | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB28 | QDB31 |       |       | 524              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0602  | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB28 | QDB31 |       |       | 526              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0616  | QDB2 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB28 | QDB31 |       |       | 526              | 548 | 549 | 570 | 582 | 583 |     |     |  |  |
| QDB1*0614  | QDB2 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB28 | QDB31 |       |       | 524              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0615  | QDB1 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB27 | QDB32 |       |       | 526              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0607  | QDB2 | QDB5             | QDB8  | QDB12 | QDB13 | QDB20 | QDB22 | QDB27 | QDB32 |       |       | 524              | 548 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*0304  | QDB1 | QDB6             | QDB9  | QDB11 | QDB13 | QDB19 | QDB22 | QDB27 | QDB30 | QDB35 |       | 526              | 538 | 549 | 582 | 583 |     |     |     |  |  |
| QDB1*06052 | QDB8 | QDB12            | QDB13 | QDB22 | QDB27 |       |       |       |       |       |       | 524              | 526 | 549 | 582 | 583 |     |     |     |  |  |

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Table 24

| Correspondence of the patchworks and SEQ ID Nos for DQB1 |     |     |     |     |     |     |
|--|-----|-----|-----|-----|-----|-----|
| patchwork SEQ ID NO:                                     |     |     |     |     |     |     |
| DQB1   | 507 |     |     |     |     |     |
| DQB2   | 508 |     |     |     |     |     |
| DQB3   | 509 |     |     |     |     |     |
| DQB4   | 510 |     |     |     |     |     |
| DQB5   | 511 |     |     |     |     |     |
| DQB6   | 512 |     |     |     |     |     |
| DQB7   | 517 | 520 | 522 |     |     |     |
| DQB8   | 518 | 521 | 523 |     |     |     |
| DQB9   | 519 |     |     |     |     |     |
| DQB10  | 533 | 536 | 537 |     |     |     |
| DQB11  | 534 |     |     |     |     |     |
| DQB12  | 535 |     |     |     |     |     |
| DQB13  | 540 | 543 | 544 | 545 | 546 | 547 |
| DQB14  | 541 |     |     |     |     |     |
| DQB15  | 542 |     |     |     |     |     |
| DQB16  | 559 |     |     |     |     |     |
| DQB17  | 560 |     |     |     |     |     |
| DQB18  | 561 | 565 | 568 | 569 |     |     |
| DQB19  | 562 | 566 |     |     |     |     |
| DQB20  | 563 | 567 |     |     |     |     |
| DQB21  | 564 |     |     |     |     |     |
| DQB22  | 572 |     |     |     |     |     |
| DQB23  | 573 |     |     |     |     |     |
| DQB24  | 574 |     |     |     |     |     |
| DQB25  | 575 |     |     |     |     |     |
| DQB26  | 576 |     |     |     |     |     |
| DQB27  | 577 | 579 |     |     |     |     |
| DQB28  | 578 |     |     |     |     |     |
| DQB29  | 586 |     |     |     |     |     |
| DQB30  | 587 |     |     |     |     |     |
| DQB31  | 588 |     |     |     |     |     |
| DQB32  | 589 |     |     |     |     |     |
| DQB33  | 528 | 532 |     |     |     |     |
| DQB34  | 554 | 557 |     |     |     |     |
| DQB35  | 555 | 558 |     |     |     |     |

Table 25-1 Correspondence of the patchwork regions and satellite regions for types of DRB1

|    |            | patchwork region |    |      |     |     |     |     |     |     |     |     |     |     |     | satellite region |     |
|----|------------|------------------|----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|
| 5  | DRB1*0101  | D1               | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D73 |                  |     |
|    | DRB1*0419  | D1               | D5 | D10  | D16 | D23 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D73 |     |                  |     |
|    | DRB1*0105  | D1               | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D73 | 688              |     |
|    | DRB1*01021 | D1               | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D48 | D51 | D59 | D63 | D71 | D74 | 791              |     |
|    | DRB1*0104  | D1               | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74 | 783              |     |
| 10 | DRB1*01022 | D1               | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D48 | D51 | D59 | D69 | D71 | D74 | 791              |     |
|    | DRB1*0406  | D1               | D5 | D10  | D16 | D23 | D29 | D31 | D48 | D51 | D59 | D65 | D70 | D74 |     |                  |     |
|    | DRB1*0420  | D1               | D5 | D10  | D16 | D23 | D29 | D31 | D48 | D51 | D59 | D65 | D70 | D73 |     |                  |     |
|    | DRB1*0106  | D1               | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D48 | D57 | D59 | D63 | D70 | D74 |                  |     |
|    | DRB1*0304  | D1               | D6 | D10  | D14 | D19 | D23 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |     |
| 15 | DRB1*0421  | D1               | D5 | D10  | D16 | D23 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |     |                  |     |
|    | DRB1*03021 | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D56 | D59 | D66 | D70 | D73 | 782              |     |
|    | DRB1*0303  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |     |
|    | DRB1*0306  | D1               | D6 | D10  | D14 | D19 | D24 | D29 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |     |
|    | DRB1*0305  | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D73 | 782              |     |
| 20 | DRB1*0309  | D1               | D6 | D10  | D14 | D21 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D73 | 782              |     |
|    | DRB1*0307  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |     |
|    | DRB1*03011 | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |     |
|    | DRB1*0311  | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D67 | D70 | D74 | 782              |     |
|    | DRB1*03012 | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 783              |     |
| 25 | DRB1*0314  | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D73 |                  |     |
|    | DRB1*0316  | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D74 | 782              | 699 |
|    | DRB1*0315  | D1               | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D66 | D70 | D74 |                  |     |
|    | DRB1*1421  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D56 | D59 | D63 | D70 | D74 |                  |     |
| 30 | DRB1*03022 | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D56 | D59 | D66 | D70 | D73 | 783              |     |
|    | DRB1*1419  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |                  |     |
|    | DRB1*1320  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D52 | D59 | D63 | D70 | D74 |                  |     |
|    | DRB1*1329  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D52 | D59 | D63 | D70 | D73 |                  |     |
|    | DRB1*1412  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D54 | D59 | D64 | D70 | D74 |                  |     |
|    | DRB1*1403  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D54 | D59 | D64 | D70 | D73 |                  |     |
| 35 | DRB1*1406  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74 |                  |     |
|    | DRB1*1417  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D51 | D59 | D63 | D70 | D74 |                  |     |
|    | DRB1*1433  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D51 | D59 | D65 | D70 | D74 |                  |     |
|    | DRB1*1430  | D1               | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D48 | D51 | D59 | D63 | D70 | D73 |                  |     |
| 40 | DRB1*1429  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74 | 791              |     |
|    | DRB1*1402  | D1               | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D73 |                  |     |
|    | DRB1*1409  | D1               | D5 | D10  | D14 | D19 | D24 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D73 |                  |     |
|    | DRB1*04031 | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D65 | D70 | D74 |     |                  |     |
|    | DRB1*0407  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D65 | D70 | D73 |     |                  |     |
|    | DRB1*0427  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D65 | D70 | D74 |     | 791              |     |
| 45 | DRB1*0404  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74 |     |                  |     |
|    | DRB1*0408  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D73 |     |                  |     |
|    | DRB1*0423  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74 |     | 799              |     |
|    | DRB1*0432  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74 |     | 751              |     |
|    | DRB1*0431  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D51 | D59 | D64 | D70 | D73 |     |                  |     |
| 50 | DRB1*1344  | D1               | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D48 | D51 | D59 | D63 | D70 | D74 |                  |     |
|    | DRB1*0317  | D1               | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D48 | D56 | D59 | D67 | D70 | D73 | 699              | 783 |
|    | DRB1*04011 | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |     |                  |     |
|    | DRB1*04012 | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |     | 665              |     |
|    | DRB1*0413  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D74 |     |                  |     |
|    | DRB1*0422  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D56 | D59 | D66 | D70 | D74 |     | 782              |     |
| 55 | DRB1*0433  | D1               | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |     | 684              |     |



Table 25-2

|    | patchwork region |    |    |      |     |     |     |     |     |     |     |     |     |     | satellite region |     |
|----|------------------|----|----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|
| 5  | DRBI*0434        | D1 | D5 | D10  | D16 | D25 | D29 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |                  |     |
|    | DRBI*0435        | D1 | D5 | D10  | D16 | D25 | D30 | D31 | D48 | D56 | D59 | D63 | D70 | D73 |                  |     |
|    | DRBI*0813        | D2 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D48 | D54 | D59 | D64 | D70 | D73              |     |
|    | DRBI*1325        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D48 | D54 | D59 | D63 | D70 | D73              |     |
|    | DRBI*10011       | D1 | D4 | DD11 | D17 | D22 | D25 | D29 | D31 | D48 | D55 | D62 | D63 | D70 | D73              | 752 |
| 10 | DRBI*10012       | D1 | D4 | DD11 | D17 | D22 | D25 | D29 | D31 | D48 | D55 | D60 | D63 | D70 | D73              | 753 |
|    | DRBI*1414        | D1 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D48 | D55 | D59 | D65 | D71 | D73              |     |
|    | DRBI*1436        | D1 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D48 | D55 | D59 | D65 | D71 | D73              | 686 |
|    | DRBI*1423        | D1 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D48 | D55 | D59 | D65 | D71 | D74              |     |
|    | DRBI*1420        | D1 | D5 | D11  | D14 | D19 | D26 | D29 | D31 | D48 | D51 | D59 | D63 | D70 | D74              |     |
| 15 | DRBI*0103        | D1 | D4 | DD11 | D13 | D18 | D23 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D73              |     |
|    | DRBI*15022       | D1 | D5 | D10  | D15 | D20 | D23 | D30 | D31 | D49 | D57 | D59 | D63 | D70 | D73              |     |
|    | DRBI*1301        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
|    | DRBI*1327        | D1 | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
|    | DRBI*1315        | D1 | D5 | D11  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
| 20 | DRBI*1328        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D74              | 789 |
|    | DRBI*1340        | D1 | D5 | D10  | D14 | D19 | D24 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
|    | DRBI*13021       | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D73              |     |
|    | DRBI*13022       | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D60 | D63 | D70 | D73              |     |
|    | DRBI*1334        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D73              | 664 |
|    | DRBI*1335        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D73              | 687 |
| 25 | DRBI*1336        | D1 | D5 | D10  | D14 | D19 | D24 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D73              |     |
|    | DRBI*1341        | D1 | D6 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D73              |     |
|    | DRBI*1316        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D75              |     |
|    | DRBI*1306        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D54 | D59 | D63 | D70 | D74              |     |
|    | DRBI*1310        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D53 | D59 | D63 | D70 | D74              |     |
| 30 | DRBI*1424        | D1 | D5 | D11  | D14 | D19 | D24 | D29 | D31 | D49 | D57 | D59 | D63 | D70 | D73              |     |
|    | DRBI*1309        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D49 | D57 | D59 | D63 | D70 | D74              |     |
|    | DRBI*0402        | D1 | D5 | D10  | D16 | D25 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D74 |                  |     |
|    | DRBI*0414        | D1 | D5 | D10  | D16 | D25 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D73 |                  |     |
|    | DRBI*1317        | D2 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
| 35 | DRBI*1322        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
|    | DRBI*1323        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D49 | D52 | D59 | D63 | D70 | D73              |     |
|    | DRBI*0418        | D1 | D5 | D10  | D16 | D25 | D29 | D31 | D49 | D54 | D59 | D64 | D70 | D74 |                  |     |
|    | DRBI*1337        | D1 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D49 | D53 | D59 | D63 | D70 | D73              |     |
|    | DRBI*1308        | D1 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
| 40 | DRBI*1319        | D1 | D5 | D11  | D14 | D19 | D26 | D29 | D31 | D49 | D52 | D59 | D63 | D70 | D74              |     |
|    | DRBI*0425        | D1 | D5 | D10  | D16 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D74 |                  |     |
|    | DRBI*0436        | D1 | D5 | D10  | D16 | D25 | D29 | D31 | D50 | D54 | D59 | D63 | D70 | D74 |                  |     |
|    | DRBI*08021       | D2 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D73              |     |
|    | DRBI*08022       | D2 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D73              |     |
| 45 | DRBI*08041       | D2 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D74              |     |
|    | DRBI*08042       | *  | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D75              |     |
|    | DRBI*08043       | D2 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D75              |     |
|    | DRBI*0820        | D1 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D74              |     |
|    | DRBI*1311        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D50 | D54 | D59 | D63 | D70 | D74              |     |
|    | DRBI*13141       | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D50 | D54 | D59 | D63 | D70 | D73              |     |
| 50 | DRBI*1324        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D31 | D50 | D52 | D59 | D63 | D70 | D74              |     |
|    | DRBI*13071       | D1 | D5 | D10  | D13 | D18 | D25 | D29 | D31 | D50 | D53 | D59 | D63 | D70 | D73              |     |
|    | DRBI*0809        | D2 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D73              |     |
|    | DRBI*0821        | D2 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D73              |     |
|    | DRBI*1415        | D2 | D5 | D10  | D14 | D19 | D26 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D74              |     |
| 55 | DRBI*1318        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D31 | D50 | D54 | D59 | D64 | D70 | D74              |     |

Table 25-3

|    | patchwork region |    |    |     |     |     |     |     |     |     |     |     |     |     |     | satellite region |  |
|----|------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|--|
| 5  | DRB1*1342        | D1 | D5 | D10 | D14 | D19 | D24 | D30 | D31 | D50 | D54 | D59 | D63 | D70 | D74 |                  |  |
|    | DRB1*1427        | D1 | D5 | D11 | D14 | D19 | D24 | D29 | D31 | D50 | D54 | D59 | D64 | D70 | D73 |                  |  |
|    | DRB1*1305        | D1 | D5 | D10 | D14 | D19 | D24 | D30 | D31 | D50 | D53 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*0312        | D1 | D6 | D10 | D14 | D19 | D24 | D30 | D32 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |  |
|    | DRB1*0411        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D65 | D70 | D74 |     |                  |  |
| 10 | DRB1*0417        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D65 | D70 | D73 |     |                  |  |
|    | DRB1*0410        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D63 | D70 | D74 |     |                  |  |
|    | DRB1*04051       | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D63 | D70 | D73 |     |                  |  |
|    | DRB1*04052       | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D63 | D70 | D73 |     | 685              |  |
|    | DRB1*0429        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D63 | D70 | D73 |     | 700              |  |
| 15 | DRB1*0430        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D51 | D59 | D63 | D70 | D73 |     | 697              |  |
|    | DRB1*0428        | D1 | D5 | D10 | D16 | D25 | D30 | D32 | D48 | D51 | D59 | D63 | D70 | D73 |     |                  |  |
|    | DRB1*0409        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D48 | D56 | D59 | D63 | D70 | D73 |     |                  |  |
|    | DRB1*0412        | D1 | D5 | D10 | D16 | D25 | D29 | D32 | D49 | D54 | D59 | D64 | D70 | D74 |     |                  |  |
|    | DRB1*0810        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D64 | D70 | D74 |                  |  |
| 20 | DRB1*0812        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D64 | D70 | D74 | 791              |  |
|    | DRB1*08032       | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D64 | D70 | D73 |                  |  |
|    | DRB1*0814        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D64 | D70 | D73 |                  |  |
|    | DRB1*1313        | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D64 | D70 | D73 |                  |  |
|    | DRB1*0818        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D63 | D70 | D73 |                  |  |
| 25 | DRB1*1312        | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1330        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D32 | D49 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*13031       | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D53 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*13032       | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D53 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1333        | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D53 | D59 | D63 | D70 | D73 | 782              |  |
|    | DRB1*1304        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D32 | D49 | D52 | D59 | D63 | D70 | D74 |                  |  |
| 30 | DRB1*1338        | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D49 | D52 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1332        | D1 | D5 | D10 | D14 | D19 | D24 | D29 | D32 | D49 | D52 | D59 | D63 | D70 | D74 |                  |  |
|    | DRB1*0801        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D50 | D54 | D59 | D64 | D70 | D73 |                  |  |
|    | DRB1*0817        | D2 | D5 | D10 | D13 | D18 | D25 | D30 | D32 | D50 | D54 | D59 | D64 | D70 | D73 |                  |  |
|    | DRB1*0816        | D2 | D5 | D10 | D13 | D18 | D27 | D29 | D32 | D50 | D54 | D59 | D64 | D70 | D73 |                  |  |
| 35 | DRB1*0806        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D50 | D54 | D59 | D64 | D70 | D74 |                  |  |
|    | DRB1*0822        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D50 | D54 | D59 | D64 | D70 | D74 | 791              |  |
|    | DRB1*0805        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D32 | D50 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1321        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D32 | D50 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1413        | D1 | D5 | D11 | D14 | D19 | D24 | D29 | D32 | D48 | D51 | D59 | D63 | D70 | D73 |                  |  |
| 40 | DRB1*0308        | D1 | D6 | D10 | D14 | D19 | D24 | D30 | D43 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |  |
|    | DRB1*1107        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D48 | D56 | D59 | D66 | D70 | D74 | 782              |  |
|    | DRB1*11081       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D48 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*11082       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D48 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1136        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D48 | D52 | D59 | D63 | D70 | D74 |                  |  |
| 45 | DRB1*1126        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D48 | D51 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*1134        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D48 | D51 | D59 | D63 | D70 | D74 |                  |  |
|    | DRB1*1113        | D1 | D5 | D10 | D14 | D19 | D26 | D30 | D43 | D48 | D55 | D59 | D63 | D71 | D74 |                  |  |
|    | DRB1*1117        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D43 | D48 | D55 | D59 | D65 | D71 | D74 |                  |  |
|    | DRB1*11011       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73 |                  |  |
| 50 | DRB1*11012       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73 |                  |  |
|    | DRB1*11013       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D60 | D63 | D70 | D73 |                  |  |
|    | DRB1*11271       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73 | 783              |  |
|    | DRB1*11272       | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73 | 782              |  |
|    | DRB1*1130        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73 | 594              |  |
|    | DRB1*1105        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73 | 597              |  |
| 55 | DRB1*1137        | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D43 | D50 | D54 | D59 | D63 | D70 | D73 |                  |  |

Table 25-4

|    | patchwork region |    |    |      |     |     |     |     |     |     |     |     |     |     | satellite region |     |     |  |
|----|------------------|----|----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|--|
|    | DRB1*0415        | D1 | D5 | D10  | D16 | D25 | D29 | D43 | D50 | D54 | D59 | D63 | D70 | D74 |                  |     |     |  |
| 5  | DRB1*1122        | D1 | D5 | D10  | D15 | D20 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1139        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              | 699 |     |  |
|    | DRB1*1123        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D64 | D70 | D73              |     |     |  |
|    | DRB1*1132        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D68 | D70 | D73              |     |     |  |
|    | DRB1*1125        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D64 | D70 | D74              |     |     |  |
| 10 | DRB1*1106        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D74              | 791 |     |  |
|    | DRB1*11041       | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D74              |     |     |  |
|    | DRB1*11042       | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D74              |     |     |  |
|    | DRB1*1111        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D52 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1141        | D1 | D5 | D10  | D13 | D18 | D25 | D29 | D43 | D50 | D52 | D59 | D63 | D70 | D74              |     |     |  |
| 15 | DRB1*1103        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D53 | D59 | D63 | D70 | D74              |     |     |  |
|    | DRB1*1109        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1128        | D1 | D5 | D10  | D13 | D18 | D24 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1110        | D1 | D5 | D10  | D14 | D19 | D26 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*11121       | D1 | D5 | D10  | D13 | D18 | D26 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
| 20 | DRB1*1115        | D1 | D5 | D10  | D13 | D18 | D27 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              | 666 |     |  |
|    | DRB1*1124        | D1 | D5 | D10  | D13 | D18 | D27 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1129        | D1 | D5 | D10  | D13 | D18 | D23 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1119        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D49 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1118        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D49 | D54 | D59 | D63 | D70 | D74              |     |     |  |
| 25 | DRB1*1114        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D49 | D52 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1102        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D49 | D52 | D59 | D63 | D70 | D74              |     |     |  |
|    | DRB1*1121        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D49 | D52 | D59 | D63 | D70 | D74              | 791 |     |  |
|    | DRB1*1120        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D43 | D49 | D52 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1116        | D1 | D5 | D10  | D14 | D19 | D24 | D30 | D43 | D49 | D52 | D59 | D63 | D70 | D74              |     |     |  |
| 30 | DRB1*1204        | D2 | D8 | D11  | D14 | D19 | D28 | D30 | D43 | D49 | D54 | D60 | D63 | D71 | D74              | D76 | 791 |  |
|    | DRB1*1131        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D49 | D54 | D59 | D63 | D70 | D73              |     | 718 |  |
|    | DRB1*1133        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D73              |     | 716 |  |
|    | DRB1*1135        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D74              |     | 716 |  |
|    | DRB1*1138        | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D43 | D50 | D54 | D59 | D63 | D70 | D74              |     | 715 |  |
| 35 | DRB1*1201        | D2 | D8 | D11  | D14 | D19 | D28 | D30 | D45 | D49 | D54 | D60 | D63 | D71 | D74              | D76 | 791 |  |
|    | DRB1*1206        | D2 | D8 | D11  | D14 | D19 | D28 | D30 | D45 | D49 | D54 | D60 | D63 | D71 | D74              | D76 | 791 |  |
|    | DRB1*12032       | D2 | D8 | D11  | D14 | D19 | D28 | D30 | D45 | D49 | D54 | D60 | D63 | D70 | D74              | D76 |     |  |
|    | DRB1*1205        | D2 | D8 | D11  | D14 | D19 | D26 | D30 | D45 | D49 | D54 | D60 | D63 | D71 | D74              | D76 | 791 |  |
|    | DRB1*12021       | D2 | D8 | D11  | D14 | D19 | D28 | D30 | D45 | D50 | D54 | D60 | D63 | D71 | D74              | D76 | 791 |  |
|    | DRB1*12022       | D2 | D8 | D11  | D14 | D19 | D28 | D30 | D45 | D50 | D54 | D60 | D63 | D70 | D74              | D76 | 791 |  |
| 40 | DRB1*07011       | D1 | D5 | DD11 | D15 | D20 | D26 | D29 | D45 | D49 | D58 | D59 | D67 | D72 | D73              |     |     |  |
|    | DRB1*07012       | D1 | D5 | DD11 | D15 | D20 | D26 | D29 | D45 | D49 | D58 | D59 | D67 | D72 | D73              |     | 595 |  |
|    | DRB1*0703        | D1 | D5 | DD11 | D15 | D20 | D26 | D29 | D45 | D49 | D58 | D59 | D67 | D72 | D73              |     | 631 |  |
|    | DRB1*0704        | D1 | D5 | DD11 | D15 | D20 | D26 | D29 | D45 | D49 | D58 | D59 | D67 | D70 | D73              |     | 783 |  |
|    | DRB1*04032       | D1 | D5 | D10  | D16 | D25 | D29 | D33 | D48 | D51 | D59 | D65 | D70 | D74 |                  |     |     |  |
| 45 | DRB1*1505        | D1 | D5 | D10  | D15 | D20 | D23 | D30 | D33 | D48 | D57 | D59 | D63 | D70 | D74              |     |     |  |
|    | DRB1*1506        | D1 | D5 | D10  | D15 | D20 | D23 | D30 | D33 | D48 | D57 | D59 | D63 | D70 | D74              | 698 |     |  |
|    | DRB1*16021       | D1 | D5 | D10  | D15 | D20 | D23 | D29 | D33 | D48 | D54 | D60 | D63 | D70 | D73              |     |     |  |
|    | DRB1*16022       | D1 | D5 | D10  | D15 | D20 | D23 | D29 | D33 | D48 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*13072       | D1 | D5 | D10  | D13 | D18 | D25 | D29 | D33 | D50 | D53 | D59 | D63 | D70 | D73              |     |     |  |
| 50 | DRB1*13142       | D1 | D5 | D10  | D13 | D18 | D25 | D30 | D33 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1326        | D1 | D5 | D10  | D14 | D19 | D24 | D29 | D33 | D50 | D54 | D60 | D63 | D70 | D73              |     |     |  |
|    | DRB1*1608        | D1 | D5 | D10  | D15 | D20 | D24 | D29 | D33 | D50 | D54 | D60 | D63 | D70 | D73              |     |     |  |
|    | DRB1*16011       | D1 | D5 | D10  | D15 | D20 | D23 | D29 | D33 | D50 | D54 | D60 | D63 | D70 | D73              |     |     |  |
|    | DRB1*16012       | D1 | D5 | D10  | D15 | D20 | D23 | D29 | D33 | D50 | D54 | D59 | D63 | D70 | D73              |     |     |  |
| 55 | DRB1*1603        | D1 | D5 | D10  | D15 | D20 | D23 | D29 | D33 | D50 | D54 | D61 | D63 | D70 | D73              |     |     |  |

Table 25-5

|    | patchwork region |    |    |     |     |     |     |     |     |     |     |     |     |     | satellite region |     |  |
|----|------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|--|
| 5  | DRB1*1604        | D1 | D5 | D10 | D15 | D20 | D23 | D29 | D33 | D50 | D54 | D59 | D64 | D70 | D73              |     |  |
|    | DRB1*1504        | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D50 | D57 | D59 | D63 | D70 | D74              |     |  |
|    | DRB1*15011       | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D74              |     |  |
|    | DRB1*15012       | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D74              | 790 |  |
| 10 | DRB1*1503        | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D74              | 632 |  |
|    | DRB1*1509        | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D74              | 696 |  |
|    | DRB1*1507        | D1 | D5 | D10 | D15 | D20 | D23 | D29 | D33 | D49 | D57 | D59 | D63 | D70 | D74              |     |  |
|    | DRB1*15021       | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D73              |     |  |
|    | DRB1*15023       | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D73              |     |  |
| 15 | DRB1*1508        | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D57 | D59 | D63 | D70 | D73              | 725 |  |
|    | DRB1*1510        | D1 | D5 | D10 | D15 | D20 | D23 | D30 | D33 | D49 | D52 | D59 | D63 | D70 | D74              |     |  |
|    | DRB1*1605        | D1 | D5 | D10 | D15 | D20 | D23 | D29 | D33 | D49 | D54 | D60 | D63 | D70 | D73              |     |  |
|    | DRB1*1607        | D1 | D5 | D10 | D15 | D20 | D23 | D29 | D33 | D49 | D54 | D60 | D63 | D70 | D73              | 618 |  |
|    | DRB1*0416        | D1 | D5 | D10 | D16 | D25 | D29 | D44 | D48 | D56 | D59 | D63 | D70 | D73 |                  |     |  |
| 20 | DRB1*0426        | D1 | D5 | D10 | D16 | D25 | D29 | D41 | D48 | D56 | D59 | D63 | D70 | D73 |                  |     |  |
|    | DRB1*0807        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D38 | D50 | D54 | D59 | D64 | D70 | D73              |     |  |
|    | DRB1*0811        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D38 | D50 | D54 | D59 | D64 | D70 | D73              |     |  |
|    | DRB1*0815        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D42 | D49 | D54 | D59 | D64 | D70 | D73              | 717 |  |
|    | DRB1*0819        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D40 | D49 | D54 | D59 | D64 | D70 | D73              |     |  |
| 25 | DRB1*09012       | D1 | D7 | D12 | D13 | D18 | D24 | D29 | D38 | D50 | D55 | D59 | D65 | D72 | D73              |     |  |
|    | DRB1*0808        | D2 | D5 | D10 | D13 | D18 | D25 | D29 | D36 | D50 | D54 | D59 | D64 | D70 | D73              |     |  |
|    | DRB1*14011       | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1407        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D65 | D71 | D73              |     |  |
|    | DRB1*1410        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D65 | D71 | D74              | 596 |  |
| 30 | DRB1*1426        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D65 | D71 | D74              | 608 |  |
|    | DRB1*1404        | D2 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1428        | D2 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D65 | D71 | D74              | 791 |  |
|    | DRB1*1431        | D2 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D63 | D71 | D74              |     |  |
|    | DRB1*1432        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D48 | D55 | D59 | D63 | D70 | D74              |     |  |
| 35 | DRB1*1435        | D1 | D5 | D10 | D14 | D19 | D26 | D30 | D36 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1343        | D1 | D5 | D10 | D14 | D19 | D24 | D30 | D36 | D48 | D52 | D59 | D63 | D70 | D74              |     |  |
|    | DRB1*1345        | D1 | D5 | D10 | D13 | D18 | D25 | D30 | D36 | D49 | D52 | D59 | D63 | D70 | D73              |     |  |
|    | DRB1*1416        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D49 | D52 | D59 | D63 | D70 | D74              |     |  |
|    | DRB1*0310        | D1 | D6 | D10 | D14 | D19 | D24 | D30 | D36 | D48 | D56 | D59 | D66 | D70 | D74              | 782 |  |
| 40 | DRB1*1422        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D36 | D50 | D54 | D59 | D63 | D70 | D73              |     |  |
|    | DRB1*1425        | D1 | D5 | D10 | D13 | D18 | D25 | D29 | D36 | D50 | D54 | D59 | D63 | D70 | D73              |     |  |
|    | DRB1*1331        | D1 | D5 | D10 | D14 | D19 | D24 | D30 | D34 | D49 | D52 | D59 | D63 | D70 | D73              |     |  |
|    | DRB1*1339        | D1 | D5 | D10 | D14 | D19 | D24 | D30 | D35 | D49 | D52 | D59 | D63 | D70 | D73              |     |  |
|    | DRB1*0313        | D1 | D6 | D10 | D14 | D19 | D24 | D30 | D35 | D48 | D56 | D59 | D66 | D70 | D74              | 782 |  |
| 45 | DRB1*1408        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D46 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1411        | D2 | D5 | D10 | D14 | D19 | D26 | D29 | D47 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1418        | D1 | D5 | D11 | D14 | D19 | D24 | D29 | D37 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1405        | D3 | D5 | D10 | D14 | D19 | D26 | D29 | D37 | D48 | D55 | D59 | D65 | D71 | D74              |     |  |
|    | DRB1*1437        | D3 | D5 | D10 | D14 | D19 | D26 | D29 | D37 | D49 | D57 | D59 | D63 | D70 | D74              |     |  |
| 50 | DRB1*1434        | D1 | D5 | D10 | D14 | D19 | D26 | D29 | D46 | D48 | D55 | D59 | D63 | D71 | D74              |     |  |

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Table 26

| Correspondence of the patchworks and SEQ ID Nos for DRB1 |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
|--|------------|-----|-----|-----|-----|-----|--|--|--|--|--|--|--|--|--|--|
| patchwork  | SEQ ID NO: |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
|  | 600        | 603 | 604 | 605 | 606 | 607 |  |  |  |  |  |  |  |  |  |  |
| D1   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D2   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D3   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D4   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D5   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D6   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D7   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D8   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D9   |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D10  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D11  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D12  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D13  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D14  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D15  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D16  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D17  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D18  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D19  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D20  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D21  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D22  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D23  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |
| D24  |            |     |     |     |     |     |  |  |  |  |  |  |  |  |  |  |

Table 26 (continued)

| Correspondence of the patchworks and SEQ ID Nos for DRB1 |            |     |     |     |     |     |  |  |  |  |  |  |
|--|------------|-----|-----|-----|-----|-----|--|--|--|--|--|--|
| patchwork  | SEQ ID NO: |     |     |     |     |     |  |  |  |  |  |  |
|  | 669        | 675 | 679 | 681 | 682 | 683 |  |  |  |  |  |  |
| D25  |            |     |     |     |     |     |  |  |  |  |  |  |
| D26  | 670        | 676 | 680 |     |     |     |  |  |  |  |  |  |
| D27  | 671        | 677 |     |     |     |     |  |  |  |  |  |  |
| D28  | 672        |     |     |     |     |     |  |  |  |  |  |  |
| D29  | 689        | 691 | 693 | 695 |     |     |  |  |  |  |  |  |
| D30  | 690        | 692 | 694 |     |     |     |  |  |  |  |  |  |
| D31  | 701        |     |     |     |     |     |  |  |  |  |  |  |
| D32  | 702        |     |     |     |     |     |  |  |  |  |  |  |
| D33  | 703        |     |     |     |     |     |  |  |  |  |  |  |
| D34  | 704        |     |     |     |     |     |  |  |  |  |  |  |
| D35  | 705        |     |     |     |     |     |  |  |  |  |  |  |
| D36  | 706        |     |     |     |     |     |  |  |  |  |  |  |
| D37  | 707        |     |     |     |     |     |  |  |  |  |  |  |
| D38  | 708        |     |     |     |     |     |  |  |  |  |  |  |
| D39  | 709        |     |     |     |     |     |  |  |  |  |  |  |
| D40  | 710        |     |     |     |     |     |  |  |  |  |  |  |
| D41  | 711        |     |     |     |     |     |  |  |  |  |  |  |
| D42  | 712        |     |     |     |     |     |  |  |  |  |  |  |
| D43  | 713        | 722 | 723 | 724 |     |     |  |  |  |  |  |  |
| D44  | 714        |     |     |     |     |     |  |  |  |  |  |  |
| D45  | 719        |     |     |     |     |     |  |  |  |  |  |  |
| D46  | 720        |     |     |     |     |     |  |  |  |  |  |  |
| D47  | 721        |     |     |     |     |     |  |  |  |  |  |  |
| D48  | 726        | 729 |     |     |     |     |  |  |  |  |  |  |

Table 26 (continued)

| Correspondence of the patchworks and SEQ ID Nos for DRB1 |  | SEQ ID NO: |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|--|--|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| patchwork  |  | 727        | 730 | 732 |     |     |     |     |     |     |     |     |     |     |     |     |
| D49  |  |            |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D50  |  | 728        | 731 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D51  |  | 733        | 741 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D52  |  | 734        | 742 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D53  |  | 735        | 743 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D54  |  | 736        | 744 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D55  |  | 737        | 745 | 747 |     |     |     |     |     |     |     |     |     |     |     |     |
| D56  |  | 738        | 746 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D57  |  | 739        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D58  |  | 740        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D59  |  | 748        | 754 | 756 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 767 | 768 | 769 | 770 |
| D60  |  | 749        | 755 | 757 |     |     |     |     |     |     |     |     |     |     |     |     |
| D61  |  | 750        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D62  |  | 752        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D63  |  | 771        | 778 | 779 | 780 | 781 |     |     |     |     |     |     |     |     |     |     |
| D64  |  | 772        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D65  |  | 773        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D66  |  | 774        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D67  |  | 775        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D68  |  | 776        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D69  |  | 777        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D70  |  | 784        | 787 | 788 |     |     |     |     |     |     |     |     |     |     |     |     |
| D71  |  | 785        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| D72  |  | 786        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

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Table 26 (continued)

| Correspondence of the patchworks and SEQ ID Nos for DRB1 |     |            |     |     |     |  |  |  |  |  |  |
|--|-----|------------|-----|-----|-----|--|--|--|--|--|--|
| patchwork  |     | SEQ ID NO: |     |     |     |  |  |  |  |  |  |
| D73  | 792 |            |     |     |     |  |  |  |  |  |  |
| D74  | 793 | 795        | 796 | 797 | 798 |  |  |  |  |  |  |
| D75  | 794 |            |     |     |     |  |  |  |  |  |  |
| D76  | 597 | 598        | 599 |     |     |  |  |  |  |  |  |



Table 27

| Correspondence of the patchwork regions and satellite regions for types of DRB 3-5 |           |    |     |     |     |     |     |     |     |     |     |     |     |     |           |     |     |     |     |
|--|-----------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|-----|-----|-----|-----|
|  | patchwork |    |     |     |     |     |     |     |     |     |     |     |     |     | satellite |     |     |     |     |
|  | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#01011   | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#0101201   | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#0101202   | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#01014   | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 | 847 |     |
| DRB3#0102  | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 | 853 |     |
| DRB3#0103  | R1        | R3 | R8  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#0104  | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 | 852 |     |
| DRB3#0105  | R1        | R3 | R10 | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#0106  | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 |     |     |     |
| DRB3#0209  | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R31 | R32 | R34 | R40 | R43 | R46 | R50       | R52 | 832 |     |     |
| DRB3#0301  | R1        | R2 | R8  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R46 | R50       | R53 |     |     |     |
| DRB3#03012   | R1        | R2 | R8  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R46 | R50       | R53 | 832 |     |     |
| DRB3#0302  | R1        | R2 | R8  | R16 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R46 | R50       | R53 |     |     |     |
| DRB3#0303  | R1        | R2 | R8  | R17 | R19 | R21 | R25 | R27 | R31 | R32 | R34 | R40 | R43 | R45 | R50       | R52 |     |     |     |
| DRB3#01013   | R1        | R3 | R7  | R17 | R19 | R21 | R25 | R27 | R32 | R33 | R34 | R40 | R43 | R45 | R50       | R52 | 832 |     |     |
| DRB3#0107  | R1        | R3 | R7  | R17 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 834 | 847 |     |
| DRB3#02022   | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 834 | 847 |     |
| DRB3#02010   | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 832 |     |     |
| DRB3#02012   | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 832 | 847 |     |
| DRB3#0205  | R1        | R2 | R8  | R17 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 832 | 847 |     |
| DRB3#02021   | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 834 | 847 |     |
| DRB3#02011   | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R35 | R40 | R43 | R46 | R50 | R52       |     | 832 | 847 |     |
| DRB3#02023   | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52       |     | 834 | 847 | 845 |
| DRB3#0201  | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R53       |     | 834 | 847 |     |

Table 27 (continued)

| Correspondence of the patchwork regions and satellite regions for types of DRB 3-5 |           |    |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |           |     |
|--|-----------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|-----------|-----|
|  | patchwork |    |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  | satellite |     |
|  | R1        | R2 | R8  | R16 | R19 | R21 | R22 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52 |  |  | 847       |     |
| DRB3†0203  | R1        | R2 | R8  | R16 | R19 | R21 | R22 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52 |  |  | 847       |     |
| DRB3†0206  | R1        | R2 | R8  | R16 | R19 | R21 | R23 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52 |  |  | 832       | 847 |
| DRB3†0204  | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R45 | R50 | R52 |  |  | 832       | 847 |
| DRB3†02013   | R1        | R4 | R8  | R16 | R19 | R21 | R24 | R27 | R28 | R34 | R40 | R43 | R46 | R50 | R52 |  |  | 832       | 847 |
| DRB3†0207  | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R31 | R34 | R40 | R43 | R46 | R50 | R52 |  |  | 832       | 847 |
| DRB3†0208  | R1        | R2 | R8  | R16 | R19 | R21 | R24 | R27 | R29 | R34 | R40 | R43 | R46 | R50 | R52 |  |  | 832       | 847 |
| DRB4†0103101   | R1        | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  |           |     |
| DRB4†01032   | R1        | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  |           |     |
| DRB4†01011   | R1        | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  |           |     |
| DRB4†01033   | R1        | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R51 | R53 |  |  |           |     |
| DRB4†0102  |           | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  | 843       |     |
| DRB4†0104  | R1        | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  | 844       |     |
| DRB4†0105  | R1        | R5 | R10 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  |           |     |
| DRB4†0201N   | R1        | R6 | R11 | R14 | R18 | R20 | R24 | R27 | R30 | R34 | R39 | R43 | R48 | R50 | R53 |  |  |           |     |
| DRB5†01011   | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R36 | R38 | R44 | R49 | R50 | R52 |  |  | 833       |     |
| DRB5†01012   | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R36 | R38 | R43 | R49 | R50 | R52 |  |  | 833       |     |
| DRB5†0105  | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R36 | R38 | R44 | R49 | R50 | R52 |  |  |           |     |
| DRB5†0104  | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R36 | R38 | R43 | R47 | R50 | R52 |  |  |           |     |
| DRB5†0106  | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R35 | R41 | R43 | R49 | R50 | R53 |  |  |           |     |
| DRB5†0107  | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R35 | R38 | R44 | R49 | R50 | R52 |  |  |           |     |
| DRB5†0109  | R1        | R2 | R12 | R15 | R18 | R20 | R26 | R27 | R30 | R36 | R42 | R44 | R49 | R50 | R52 |  |  |           |     |
| DRB5†0108N   | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R36 | R38 | R44 | R49 | R50 | R52 |  |  |           |     |
| DRB5†0102  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R36 | R38 | R44 | R49 | R50 | R52 |  |  |           |     |
| DRB5†0110N   | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R36 | R38 | R44 | R49 | R50 | R52 |  |  |           |     |

Table 27 (continued)

| Correspondence of the patchwork regions and satellite regions for types of DRB 3-5 |           |    |     |     |     |     |     |     |     |     |     |     |     |     |           |     |  |
|--|-----------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|-----|--|
|  | patchwork |    |     |     |     |     |     |     |     |     |     |     |     |     | satellite |     |  |
|  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R36 | R31 | R44 | R49 | R50 | R52       |     |  |
| DRB5±0103  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R36 | R31 | R44 | R49 | R50 | R52       |     |  |
| DRB5±0202  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R35 | R41 | R43 | R49 | R50 | R53       |     |  |
| DRB5±0203  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R35 | R41 | R43 | R49 | R50 | R52       |     |  |
| DRB5±0204  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R36 | R41 | R43 | R49 | R50 | R53       | 848 |  |
| DRB5±0205  | R1        | R2 | R12 | R13 | R18 | R20 | R23 | R27 | R30 | R34 | R37 | R43 | R49 | R50 | R53       | 848 |  |

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Table 28

| Correspondence of the patchworks and SEQ ID NOs for DRB 3-5 |            |     |     |     |  |
|---|------------|-----|-----|-----|--|
| Patchwork   | SEQ ID NO: |     |     |     |  |
| R1  | 603        | 604 | 607 |     |  |
| R2  | 610        | 803 |     |     |  |
| R3  | 611        | 804 | 805 |     |  |
| R4  | 800        |     |     |     |  |
| R5  | 801        |     |     |     |  |
| R6  | 802        |     |     |     |  |
| R7  | 620        |     |     |     |  |
| R8  | 621        | 810 | 812 | 813 |  |
| R9  | 806        |     |     |     |  |
| R10   | 807        |     |     |     |  |
| R11   | 808        |     |     |     |  |
| R12   | 809        | 811 |     |     |  |
| R13   | 814        |     |     |     |  |
| R14   | 815        |     |     |     |  |
| R15   | 816        |     |     |     |  |
| R16   | 817        |     |     |     |  |
| R17   | 818        | 819 | 820 |     |  |
| R18   | 643        | 821 | 822 |     |  |
| R19   | 823        | 824 |     |     |  |
| R20   | 825        | 826 | 659 |     |  |
| R21   | 827        | 828 | 652 | 829 |  |
| R22   | 673        |     |     |     |  |
| R23   | 668        | 678 |     |     |  |
| R24   | 682        | 831 |     |     |  |
| R25   | 676        | 680 |     |     |  |
| R26   | 830        |     |     |     |  |
| R27   | 689        | 691 |     |     |  |
| R28   | 701        |     |     |     |  |
| R29   | 702        |     |     |     |  |
| R30   | 703        |     |     |     |  |
| R31   | 704        |     |     |     |  |
| R32   | 837        |     |     |     |  |
| R33   | 838        |     |     |     |  |
| R34   | 726        |     |     |     |  |
| R35   | 727        | 730 |     |     |  |
| R36   | 728        | 731 |     |     |  |

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Table 28 (continued)

| Correspondence of the patchworks and SEQ ID NOs for DRB 3-5 |            |     |     |     |     |
|---|------------|-----|-----|-----|-----|
| Patchwork   | SEQ ID NO: |     |     |     |     |
| R37   | 733        |     |     |     |     |
| R38   | 736        | 744 | 839 |     |     |
| R39   | 737        |     |     |     |     |
| R40   | 746        |     |     |     |     |
| R41   | 739        |     |     |     |     |
| R42   | 1072       |     |     |     |     |
| R43   | 658        | 659 | 662 | 667 | 841 |
| R44   | 655        | 840 |     |     |     |
| R45   | 774        |     |     |     |     |
| R46   | 775        |     |     |     |     |
| R47   | 772        | 842 |     |     |     |
| R48   | 773        |     |     |     |     |
| R49   | 771        | 780 |     |     |     |
| R50   | 784        | 787 | 788 |     |     |
| R51   | 785        |     |     |     |     |
| R52   | 792        | 850 |     |     |     |
| R53   | 793        | 795 | 851 |     |     |

Table 29-1 Correspondence of the patchwork regions and satellite regions for types of A

|         | patchwork region |    |     |     |     |     |     |     |     |     |     |     | satellite region |     |     |     |  |  |  |  |  |  |  |  |
|---------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|-----|--|--|--|--|--|--|--|--|
|         | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*01011 | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*0106  | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 48A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*0108  | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 53A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*3601  | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 54A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*3602  | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 54A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*01012 | 1A               | 7A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*0102  | 3A               | 7A | 9A  | 14A | 19A | 25A | 29A | 33A | 36A | 45A | 47A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*0107  | 1A               | 6A | 10A | 14A | 20A | 25A | 30A | 33A | 36A | 45A | 47A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*3002  | 3A               | 7A | 10A | 14A | 20A | 25A | 30A | 33A | 36A | 44A | 48A | 54A | 60A              | 63A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3009  | 3A               | 7A | 10A | 14A | 20A | 25A | 30A | 33A | 36A | 44A | 48A | 54A | 60A              | 61A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3003  | 3A               | 7A | 9A  | 14A | 20A | 25A | 30A | 33A | 36A | 44A | 48A | 54A | 60A              | 63A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3004  | 3A               | 7A | 10A | 14A | 20A | 25A | 30A | 33A | 36A | 44A | 49A | 54A | 61A              | 64A |     |     |  |  |  |  |  |  |  |  |
| A*3006  | 3A               | 7A | 10A | 14A | 20A | 25A | 30A | 33A | 36A | 44A | 49A | 54A | 61A              | 64A |     |     |  |  |  |  |  |  |  |  |
| A*03011 | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A |     |     |  |  |  |  |  |  |  |  |
| A*0304  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A |     |     |  |  |  |  |  |  |  |  |
| A*0308  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*0305  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*0306  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*0307  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*03013 | 1A               | 6A | 11A | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*3103  | 4A               | 6A | 10A | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 60A              | 61A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3104  | 4A               | 6A | 10A | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 60A              | 61A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3001  | 3A               | 7A | 10A | 14A | 20A | 25A | 31A | 33A | 36A | 44A | 48A | 54A | 60A              | 63A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3008  | 2A               | 7A | 10A | 14A | 20A | 25A | 31A | 33A | 36A | 44A | 48A | 54A | 60A              | 63A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*03012 | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 51A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*0302  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*11011 | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*11012 | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1102  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1103  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1105  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1106  | 2A               | 6A | 9A  | 14A | 20A | 28A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1107  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1109  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 52A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1104  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 50A | 54A | 64A              |     |     |     |  |  |  |  |  |  |  |  |
| A*1108  | 2A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 36A | 45A | 47A | 52A | 62A              | 64A |     |     |  |  |  |  |  |  |  |  |
| A*3204  | 1A               | 6A | 9A  | 14A | 20A | 25A | 32A | 33A | 36A | 45A | 48A | 54A | 62A              | 64A | 58A |     |  |  |  |  |  |  |  |  |
| A*0103  | 1A               | 6A | 9A  | 14A | 19A | 25A | 29A | 33A | 37A | 45A | 47A | 52A |                  |     |     |     |  |  |  |  |  |  |  |  |
| A*3203  | 1A               | 6A | 9A  | 14A | 20A | 25A | 30A | 33A | 37A | 41A | 48A | 54A | 60A              | 61A | 64A |     |  |  |  |  |  |  |  |  |
| A*31012 | 4A               | 6A | 10A | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A              | 61A | 64A | 58A |  |  |  |  |  |  |  |  |
| A*3105  | 4A               | 6A | 10A | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A              | 61A | 64A | 58A |  |  |  |  |  |  |  |  |

Table 29-2

|         | patchwork region |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     | satellite region |      |      |      |      |      |
|---------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|------|------|------|------|------|
|         | 4A               | 6A | 10A | 14A | 21A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A | 58A | 961              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*3102  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*7401  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*7402  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*7403  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 982  | 984  | 1026 | 1031 | 1033 |
| A*7405  | 1A               | 6A | 9A  | 14A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 960  | 984  | 1026 | 1031 | 1033 |
| A*3202  | 1A               | 6A | 9A  | 14A | 20A | 25A | 32A | 33A | 37A | 41A | 50A | 54A | 61A | 64A |     |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*3201  | 1A               | 6A | 9A  | 14A | 20A | 25A | 32A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*3206  | 1A               | 6A | 9A  | 14A | 20A | 25A | 32A | 33A | 37A | 41A | 48A | 54A | 61A | 64A |     |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*3205  | 1A               | 6A | 9A  | 14A | 21A | 25A | 32A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 950  | 984  | 1026 | 1031 | 1033 |
| A*0245  | 1A               | 7A | 11A | 14A | 21A | 26A | 31A | 34A | 39A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1066 |      |      |      |      |
| A*0204  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 37A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1066 |      |      |      |      |
| A*02171 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 35A | 37A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1004 | 1066 |      |      |      |
| A*02172 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 35A | 37A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1004 | 1066 |      |      |      |
| A*7404  | 1A               | 6A | 11A | 15A | 21A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 60A | 61A | 64A |     | 926              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*2408  | 3A               | 6A | 9A  | 15A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 61A | 58A |     |     | 909              | 984  | 1004 | 1027 | 1031 |      |
| A*02012 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*02013 | 1A               | 7A | 11A | 15A | 21A | 27A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1035 | 1066 |      |      |
| A*02014 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*02015 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0209  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0224  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1066 |      |      |      |      |
| A*0236  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A |     |     |     | 984              | 1027 |      |      |      |      |
| A*02016 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              |      | 1027 | 1066 |      |      |
| A*0207  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1005 | 1027 | 1066 |      |      |
| A*0218  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1005 | 1027 | 1066 |      |      |
| A*0225  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1035 | 1066 |      |      |
| A*0226  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 62A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0230  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 909              | 984  | 1027 | 1066 |      |      |
| A*0231  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 927              | 984  | 1066 |      |      |      |
| A*0233  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1005 | 1027 | 1066 |      |      |
| A*0234  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 959              | 984  | 1027 | 1066 |      |      |
| A*0239  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1004 | 1027 | 1066 |      |      |
| A*0240  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 60A | 61A | 64A |     | 984              | 1027 | 1066 |      |      |      |
| A*0211  | 1A               | 7A | 11A | 15A | 21A | 25A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*02201 | 1A               | 7A | 11A | 15A | 20A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*02202 | 1A               | 7A | 11A | 15A | 22A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0229  | 1A               | 7A | 11A | 15A | 23A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0235  | 1A               | 7A | 11A | 15A | 21A | 25A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 959              | 984  | 1027 | 1066 |      |      |
| A*02011 | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 47A | 54A | 61A | 64A |     |     | 961              | 984  | 1027 | 1066 |      |      |
| A*0242  | 1A               | 8A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0216  | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 55A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |
| A*0206  | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |     |     | 984              | 1027 | 1066 |      |      |      |

Table 29-3

|            | patchwork region |    |     |     |     |     |     |     |     |     | satellite region |     |     |     |      |      |      |      |      |      |
|------------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|-----|------|------|------|------|------|------|
|            | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A              | 54A | 61A | 64A | 984  | 1027 | 1066 | 1066 | 1066 | 1066 |
| A*0241     | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0210     | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A              | 54A | 61A | 64A | 984  | 1004 | 1027 | 1066 |      |      |
| A*0221     | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A              | 54A | 61A | 64A | 924  | 984  | 1027 | 1066 |      |      |
| A*0244     | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0228     | 2A               | 7A | 12A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 48A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0214     | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 35A | 38A | 39A | 48A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0205     | 2A               | 7A | 11A | 15A | 21A | 26A | 31A | 35A | 38A | 39A | 49A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0208     | 2A               | 7A | 11A | 15A | 20A | 26A | 31A | 35A | 38A | 39A | 49A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0202     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 35A | 38A | 39A | 49A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0247     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 35A | 38A | 39A | 49A              | 54A | 61A | 64A | 962  | 984  | 1027 | 1066 |      |      |
| A*0203     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 49A              | 54A | 62A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0222     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 49A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0212     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 54A | 61A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0213     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 54A | 62A | 64A | 984  | 1027 | 1066 |      |      |      |
| A*0219     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 54A | 61A |     | 984  | 1027 |      |      |      |      |
| A*0227     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 54A | 64A |     | 984  | 1027 | 1066 |      |      |      |
| A*0237     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 54A | 61A |     | 984  | 1027 |      |      |      |      |
| A*0238     | 1A               | 7A | 11A | 15A | 21A | 26A | 31A | 34A | 38A | 39A | 50A              | 52A | 62A | 64A | 984  | 1027 | 1035 | 1066 |      |      |
| A*2607     | 2A               | 6A | 9A  | 15A | 21A | 25A | 29A | 33A | 38A | 41A | 49A              | 52A | 62A | 64A | 1031 | 1033 | 1035 | 1066 |      |      |
| A*3007     | 3A               | 7A | 10A | 16A | 21A | 25A | 30A | 33A | 36A | 44A | 48A              | 54A | 57A | 58A | 919  | 984  | 1011 | 1031 | 1033 | 1066 |
| A*8001     | 1A               | 7A | 13A | 16A | 20A | 28A | 29A | 33A | 36A | 45A | 49A              | 55A | 58A | 60A | 1031 |      |      |      |      |      |
| A*2404     | 3A               | 6A | 9A  | 16A | 21A | 25A | 29A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1027 | 1031 |      |
| A*2301     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1027 | 1031 | 1033 |
| A*2303     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1026 | 1031 | 1033 |
| A*2304     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 | 1033 | 1066 |
| A*2305     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 911  | 984  | 1004 | 1027 | 1031 | 1033 |
| A*2306     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 983  | 984  | 1004 | 1027 | 1031 | 1033 |
| A*2413     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 |      |      |
| A*2418     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 48A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 | 1056 | 1066 |
| A*2302     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 49A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 | 1033 |      |
| A*2406     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 49A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 |      |      |
| A*2422     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 49A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 | 1066 |      |
| A*2402101  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 |      |      |
| A*2402102L | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 |      |      |
| A*24031    | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 | 1066 |      |
| A*24022    | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 |      |      |      |
| A*2405     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1031 | 1033 |      |
| A*2407     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 959  | 984  | 1004 | 1027 | 1031 |      |
| A*2415     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 61A | 984  | 1027 | 1031 |      |      |      |
| A*2417     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 45A | 50A              | 54A | 57A | 58A | 984  | 1004 | 1027 | 1027 | 1031 |      |
| A*2420     | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A              | 54A | 57A | 58A | 909  | 984  | 1004 | 1027 | 1031 |      |



Table 29-4

|         | patchwork region |    |     |     |     |     |     |     |     |     |     |     |     |     |     | satellite region |      |      |      |      |      |
|---------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|------|------|------|------|------|
|         | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A | 984              | 1004 | 1027 | 1031 |      |      |
| A*2421  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 984  | 1004 | 1027 | 1031 |      |
| A*2425  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 911  | 984  | 1004 | 1027 | 1031 |
| A*2426  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 984  | 1004 | 1027 | 1010 | 1031 |
| A*2427  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 59A | 61A              |      | 984  | 1004 | 1027 | 1031 |
| A*2429  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 58A | 61A |     |                  | 984  | 1004 | 1027 | 1031 |      |
| A*2431  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 948  | 984  | 1004 | 1027 | 1031 |
| A*24032 | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A | 64A              | 984  | 1004 | 1027 | 1031 | 1066 |
| A*2423  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A | 64A              | 984  | 1004 | 1027 | 1031 |      |
| A*2410  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 35A | 37A | 39A | 50A | 52A | 57A | 58A | 61A | 64A              | 984  | 1004 | 1027 | 1031 | 1066 |
| A*2430  | 3A               | 6A | 9A  | 16A | 21A | 28A | 30A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 984  | 1004 | 1027 | 1031 |      |
| A*2416  | 4A               | 6A | 9A  | 16A | 21A | 25A | 30A | 33A | 37A | 41A | 48A | 54A | 57A | 58A | 60A | 61A              | 984  | 1026 | 1031 | 1033 | 1066 |
| A*2419  | 3A               | 6A | 9A  | 16A | 21A | 25A | 31A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 959  | 1004 | 1027 | 1031 |      |
| A*2428  | 3A               | 6A | 9A  | 16A | 21A | 26A | 31A | 35A | 37A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 984  | 1004 | 1027 | 1031 |      |
| A*6810  | 2A               | 6A | 9A  | 16A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 959  | 984  | 1027 | 1032 | 1066 |
| A*6814  | 2A               | 6A | 9A  | 16A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 959  | 984  | 1027 | 1032 | 1066 |
| A*0246  | 1A               | 7A | 11A | 16A | 21A | 28A | 31A | 34A | 38A | 39A | 48A | 54A | 57A | 61A | 64A |                  | 984  | 1066 |      |      |      |
| A*0248  | 1A               | 7A | 9A  | 16A | 21A | 25A | 31A | 34A | 38A | 39A | 48A | 54A | 57A | 61A | 64A |                  | 984  | 1066 |      |      |      |
| A*2414  | 3A               | 6A | 9A  | 16A | 21A | 25A | 30A | 34A | 38A | 39A | 50A | 54A | 57A | 58A | 61A |                  | 984  | 1027 | 1031 |      |      |
| A*3402  | 2A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 58A | 62A | 64A |                  | 949  | 959  | 1031 | 1033 | 1066 |
| A*3403  | 2A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 36A | 45A | 48A | 54A | 58A | 62A | 64A |                  | 949  | 959  | 1031 | 1033 | 1066 |
| A*2424  | 3A               | 6A | 9A  | 17A | 20A | 25A | 30A | 35A | 37A | 39A | 48A | 54A | 58A | 60A | 61A |                  | 949  | 959  | 984  | 1004 | 1027 |
| A*3301  | 4A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 58A | 60A | 61A | 64A              | 949  | 961  | 984  | 1026 | 1031 |
| A*3303  | 4A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 58A | 60A | 61A | 64A              | 949  | 961  | 984  | 1026 | 1031 |
| A*3304  | 4A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 58A | 60A | 61A | 64A              | 949  | 961  | 984  | 1026 | 1028 |
| A*3305  | 4A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 58A | 60A | 61A | 64A              | 933  | 949  | 961  | 984  | 1026 |
| A*3306  | 4A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 41A | 48A | 54A | 58A | 60A | 61A | 64A              | 932  | 949  | 961  | 984  | 1026 |
| A*68011 | 2A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*6804  | 2A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 961  | 984  | 1027 | 1032 |
| A*6813  | 2A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 959  | 984  | 1027 | 1032 | 1066 |
| A*6808  | 2A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 51A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*68012 | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*6812  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1066 |
| A*6816  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*6817  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1025 | 1027 |
| A*6819  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*68031 | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 984  | 1027 | 1032 | 1066 |
| A*68032 | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 908  | 949  | 984  | 1027 | 1032 |
| A*6806  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 44A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1011 | 1027 |
| A*6807  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 46A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*6805  | 5A               | 6A | 9A  | 17A | 20A | 26A | 31A | 33A | 37A | 45A | 49A | 54A | 58A | 61A | 64A |                  | 949  | 1027 | 1032 |      |      |
| A*6809  | 5A               | 6A | 9A  | 17A | 20A | 25A | 31A | 33A | 37A | 45A | 50A | 54A | 58A | 61A | 64A |                  | 949  | 959  | 984  | 1027 | 1032 |
| A*2501  | 2A               | 6A | 9A  | 17A | 20A | 25A | 32A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |     |                  | 949  | 1031 | 1033 | 1035 | 1066 |

Table 29-5

| patchwork region |    |    |    |     |     |     |     |     |     |     |     |     |     |     | satellite region |     |      |      |      |      |      |      |      |      |      |      |
|------------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|------|------|------|------|------|------|------|------|------|------|
|                  | 2A | 6A | 9A | 17A | 20A | 25A | 32A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 959  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*2502           | 2A | 6A | 9A | 17A | 20A | 25A | 32A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2503           | 1A | 6A | 9A | 17A | 20A | 25A | 32A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2601           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2610           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1027 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*2612           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 61A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2613           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 959  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*2614           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1066 |      |      |      |      |      |      |      |
| A*2615           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 925 | 949  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*2617           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 985  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*2608           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 50A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2616           | 3A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2602           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 44A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2604           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 56A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2609           | 2A | 6A | 9A | 17A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 54A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2805           | 2A | 6A | 9A | 17A | 20A | 25A | 30A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2603           | 2A | 6A | 9A | 17A | 20A | 26A | 31A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*2806           | 2A | 6A | 9A | 17A | 20A | 26A | 31A | 33A | 38A | 45A | 49A | 52A | 62A | 64A |                  | 949 | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |      |
| A*6801           | 2A | 6A | 9A | 17A | 20A | 25A | 31A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 959  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*6604           | 2A | 6A | 9A | 17A | 20A | 25A | 31A | 33A | 38A | 41A | 49A | 52A | 62A | 64A |                  | 949 | 959  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*3401           | 2A | 6A | 9A | 17A | 21A | 25A | 31A | 33A | 38A | 41A | 49A | 54A | 62A | 64A |                  | 949 | 959  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*6602           | 2A | 6A | 9A | 17A | 20A | 25A | 31A | 33A | 38A | 41A | 49A | 55A | 62A | 64A |                  | 949 | 959  | 984  | 1031 | 1033 | 1066 |      |      |      |      |      |
| A*6603           | 2A | 6A | 9A | 17A | 20A | 25A | 31A | 33A | 38A | 41A | 49A | 55A | 62A | 64A |                  | 949 | 959  | 984  | 1031 | 1033 | 1066 |      |      |      |      |      |
| A*6802           | 2A | 6A | 9A | 17A | 20A | 25A | 31A | 33A | 38A | 39A | 49A | 55A | 62A | 64A |                  | 949 | 984  | 1031 | 1033 | 1035 | 1066 |      |      |      |      |      |
| A*6815           | 2A | 6A | 9A | 17A | 20A | 26A | 31A | 33A | 38A | 39A | 49A | 54A | 61A | 64A |                  | 949 | 959  | 984  | 1027 | 1032 | 1066 |      |      |      |      |      |
| A*6901           | 2A | 6A | 9A | 17A | 20A | 25A | 31A | 34A | 38A | 39A | 48A | 54A | 61A | 64A |                  | 949 | 984  | 1027 | 1032 | 1066 |      |      |      |      |      |      |
| A*2901           | 4A | 6A | 9A | 18A | 20A | 25A | 29A | 33A | 37A | 45A | 48A | 54A | 58A | 60A | 61A              | 64A |      | 926  | 948  | 959  | 984  | 1006 | 1026 | 1031 | 1033 | 1066 |
| A*2902           | 4A | 6A | 9A | 18A | 20A | 25A | 29A | 33A | 37A | 45A | 48A | 54A | 58A | 60A | 61A              | 64A |      | 926  | 948  | 959  | 984  | 1026 | 1031 | 1033 | 1066 |      |
| A*2903           | 4A | 6A | 9A | 18A | 20A | 25A | 29A | 33A | 37A | 45A | 48A | 54A | 58A | 60A | 61A              | 64A |      | 926  | 948  | 959  | 984  | 1026 | 1031 | 1033 | 1066 |      |
| A*2904           | 4A | 6A | 9A | 18A | 24A | 25A | 29A | 33A | 37A | 45A | 48A | 54A | 58A | 60A | 61A              | 64A |      | 926  | 948  | 959  | 984  | 1026 | 1031 | 1033 | 1066 |      |
| A*4301           | 2A | 6A | 9A | 18A | 20A | 25A | 29A | 33A | 38A | 41A | 49A | 52A | 64A |     |                  | 948 | 1066 |      |      |      |      |      |      |      |      |      |

Table 30 Correspondence of the patchworks and SEQ ID Nos for A

| patchwork | SEQ ID NO: |      |     |      |      |      |
|-----------|------------|------|-----|------|------|------|
| 1A        | 912        |      |     |      |      |      |
| 2A        | 913        | 917  |     |      |      |      |
| 3A        | 914        | 918  |     |      |      |      |
| 4A        | 915        |      |     |      |      |      |
| 5A        | 916        |      |     |      |      |      |
| 6A        | 921        |      |     |      |      |      |
| 7A        | 922        |      |     |      |      |      |
| 8A        | 923        |      |     |      |      |      |
| 9A        | 934        | 939  |     |      |      |      |
| 10A       | 935        | 950  |     |      |      |      |
| 11A       | 936        |      |     |      |      |      |
| 12A       | 937        |      |     |      |      |      |
| 13A       | 938        |      |     |      |      |      |
| 14A       | 941        |      |     |      |      |      |
| 15A       | 942        | 946  |     |      |      |      |
| 16A       | 943        |      |     |      |      |      |
| 17A       | 944        | 947  |     |      |      |      |
| 18A       | 945        |      |     |      |      |      |
| 19A       | 952        |      |     |      |      |      |
| 20A       | 953        |      |     |      |      |      |
| 21A       | 954        | 958  |     |      |      |      |
| 22A       | 955        |      |     |      |      |      |
| 23A       | 956        |      |     |      |      |      |
| 24A       | 957        |      |     |      |      |      |
| 25A       | 963        | 967  | 969 | 971  |      |      |
| 26A       | 964        | 968  | 970 |      |      |      |
| 27A       | 965        |      |     |      |      |      |
| 28A       | 966        |      |     |      |      |      |
| 29A       | 972        | 976  |     |      |      |      |
| 30A       | 973        | 977  | 979 | 981  |      |      |
| 31A       | 974        | 978  | 980 |      |      |      |
| 32A       | 975        |      |     |      |      |      |
| 33A       | 986        | 989  | 991 |      |      |      |
| 34A       | 987        |      |     |      |      |      |
| 35A       | 988        | 990  |     |      |      |      |
| 36A       | 992        |      |     |      |      |      |
| 37A       | 993        | 995  | 997 | 999  |      |      |
| 38A       | 994        | 996  | 998 | 1000 | 1001 | 1002 |
| 39A       | 1012       | 1020 |     |      |      |      |
| 40A       | 1013       | 1021 |     |      |      |      |
| 41A       | 1014       |      |     |      |      |      |
| 42A       | 1015       | 1022 |     |      |      |      |
| 43A       | 1016       |      |     |      |      |      |
| 44A       | 1017       | 1023 |     |      |      |      |

| patchwork | SEQ ID NO: |      |      |      |  |  |
|-----------|------------|------|------|------|--|--|
| 45A       | 1018       | 1024 |      |      |  |  |
| 46A       | 1019       |      |      |      |  |  |
| 47A       | 1049       | 1054 |      |      |  |  |
| 48A       | 1050       |      |      |      |  |  |
| 49A       | 1051       |      |      |      |  |  |
| 50A       | 1052       |      |      |      |  |  |
| 51A       | 1053       |      |      |      |  |  |
| 52A       | 1058       | 1063 |      |      |  |  |
| 53A       | 1059       |      |      |      |  |  |
| 54A       | 1060       | 1064 | 1065 |      |  |  |
| 55A       | 1061       |      |      |      |  |  |
| 56A       | 1062       |      |      |      |  |  |
| 57A       | 950        | 951  |      |      |  |  |
| 58A       | 1007       | 1008 |      |      |  |  |
| 59A       | 1030       | 1041 |      |      |  |  |
| 60A       | 1036       | 1042 | 1046 | 1048 |  |  |
| 61A       | 1038       | 1043 | 1047 |      |  |  |
| 62A       | 1039       | 1044 |      |      |  |  |
| 63A       | 1040       | 1045 |      |      |  |  |
| 64A       | 1067       | 1071 |      |      |  |  |

[illegible]

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55

|         |    | patchwork region |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | satellite region |      |      |      |      |      |      |      |
|---------|----|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|------|------|------|------|------|------|------|
| B*51022 | 28 | 78               | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518 | 538 | 548 | 568 | 578 | 588 | 618 | 628              | 1184 | 1201 | 1233 | 1263 | 1287 | 1272 | 1283 |
| B*51105 | 28 | 78               | 128 | 158 | 218 | 268 | 308 | 348 | 418 | 478 | 518 | 538 | 548 | 568 | 578 | 588 | 618 | 628              | 1184 | 1201 | 1233 | 1263 | 1287 | 1272 | 1285 |
| B*51115 | 28 | 78               | 128 | 158 | 218 | 268 | 308 | 358 | 438 | 478 | 518 | 538 | 548 | 568 | 578 | 618 | 628 |                  | 1184 | 1201 | 1233 | 1267 | 1272 | 1285 |      |
| B*53033 | 28 | 78               | 128 | 158 | 228 | 258 | 298 | 388 | 438 | 478 | 518 | 538 | 548 | 578 | 588 | 598 | 628 |                  | 1184 | 1201 | 1232 | 1242 | 1267 | 1272 | 1285 |
| B*5801  | 28 | 78               | 128 | 188 | 218 | 268 | 288 | 388 | 438 | 478 | 518 | 528 | 548 | 568 | 578 | 588 | 598 | 628              | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 | 1242 |
| B*5804  | 28 | 78               | 128 | 188 | 218 | 268 | 288 | 388 | 438 | 478 | 518 | 528 | 548 | 568 | 578 | 588 | 598 | 628              | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 | 1242 |
| B*5805  | 28 | 78               | 128 | 188 | 218 | 268 | 288 | 388 | 438 | 478 | 518 | 528 | 548 | 568 | 578 | 588 | 598 | 628              | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 | 1242 |
| B*5806  | 28 | 78               | 128 | 188 | 218 | 268 | 318 | 388 | 438 | 478 | 518 | 528 | 548 | 568 | 578 | 588 | 598 | 628              | 1184 | 1191 | 1197 | 1199 | 1204 | 1242 | 1267 |
| B*5806  | 28 | 78               | 128 | 188 | 218 | 268 | 318 | 388 | 438 | 478 | 518 | 528 | 548 | 568 | 578 | 588 | 598 | 628              | 1184 | 1191 | 1197 | 1199 | 1204 | 1242 | 1267 |
| B*53520 | 28 | 78               | 128 | 168 | 208 | 248 | 298 | 388 | 438 | 478 | 518 | 538 | 548 | 568 | 578 | 588 | 598 | 628              | 1184 | 1232 | 1242 | 1267 | 1272 | 1285 |      |
| B*53528 | 28 | 78               | 128 | 168 | 208 | 248 | 298 | 388 | 438 | 478 | 518 | 528 | 538 | 548 | 568 | 578 | 588 | 628              | 1184 | 1201 | 1232 | 1242 | 1267 | 1272 | 1285 |
| B*7805  | 28 | 78               | 128 | 168 | 208 | 248 | 308 | 348 | 438 | 478 | 518 | 528 | 538 | 548 | 568 | 578 | 618 | 628              | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 | 1283 |
| B*52011 | 28 | 78               | 128 | 168 | 218 | 268 | 308 | 348 | 438 | 478 | 518 | 528 | 538 | 548 | 568 | 578 | 588 | 618              | 628  | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 |
| B*52013 | 28 | 78               | 128 | 168 | 218 | 268 | 308 | 348 | 438 | 478 | 518 | 528 | 538 | 548 | 568 | 578 | 588 | 618              | 628  | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 |
| B*33528 | 28 | 78               | 98  | 178 | 208 | 248 | 298 | 388 | 438 | 478 | 518 | 538 | 548 | 568 | 578 | 588 | 518 | 628              | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 | 1283 |
| B*5504  | 28 | 78               | 98  | 148 | 208 | 248 | 288 | 348 | 438 | 468 | 508 | 618 |     |     |     |     |     |                  | 1285 |      |      |      |      |      |      |
| B*5501  | 28 | 78               | 98  | 148 | 208 | 248 | 308 | 358 | 438 | 468 | 508 | 618 | 628 |     |     |     |     |                  | 1233 | 1267 | 1272 |      |      |      |      |
| B*5502  | 28 | 78               | 98  | 148 | 208 | 248 | 308 | 358 | 438 | 468 | 508 | 618 | 628 |     |     |     |     |                  | 1233 | 1267 | 1272 | 1285 |      |      |      |
| B*5503  | 28 | 78               | 98  | 148 | 208 | 248 | 308 | 358 | 438 | 468 | 508 | 618 | 628 |     |     |     |     |                  | 1233 | 1267 | 1272 |      |      |      |      |
| B*5505  | 28 | 78               | 98  | 148 | 208 | 248 | 308 | 358 | 438 | 468 | 508 | 618 | 628 |     |     |     |     |                  | 1233 | 1267 | 1272 | 1285 |      |      |      |
| B*5601  | 28 | 78               | 98  | 148 | 208 | 248 | 308 | 358 | 438 | 468 | 508 | 618 | 628 |     |     |     |     |                  | 1233 | 1267 | 1272 | 1285 |      |      |      |
| B*5509  | 28 | 78               | 98  | 148 | 208 | 248 | 308 | 358 | 418 | 458 | 508 | 618 | 628 |     |     |     |     |                  | 1233 | 1267 | 1272 |      |      |      |      |
| B*5603  | 28 | 78               | 98  | 148 | 208 | 248 | 298 | 388 | 448 | 478 | 628 |     |     |     |     |     |     |                  | 1267 |      |      |      |      |      |      |
| B*5508  | 28 | 78               | 98  | 148 | 208 | 248 | 298 | 348 | 438 | 478 | 508 | 618 |     |     |     |     |     |                  | 1285 |      |      |      |      |      |      |
| B*5602  | 28 | 78               | 98  | 148 | 208 | 248 | 298 | 358 | 438 | 478 | 508 | 618 | 628 |     |     |     |     |                  | 1267 | 1272 | 1285 |      |      |      |      |
| B*5604  | 28 | 78               | 98  | 148 | 208 | 248 | 298 | 358 | 438 | 478 | 508 | 618 | 628 |     |     |     |     |                  | 1267 | 1272 | 1285 |      |      |      |      |
| B*5607  | 28 | 78               | 98  | 148 | 218 | 258 | 308 | 358 | 438 | 478 | 508 | 578 | 568 | 618 | 628 |     |     |                  | 1233 | 1267 | 1272 | 1285 |      |      |      |
| B*5901  | 28 | 78               | 98  | 158 | 218 | 268 | 308 | 358 | 438 | 468 | 508 | 538 | 548 | 568 | 578 | 588 | 598 | 618              | 628  | 1201 | 1233 | 1267 | 1272 | 1285 |      |
| B*4601  | 28 | 78               | 118 | 148 | 208 | 248 | 298 | 388 | 448 | 478 | 528 | 558 | 628 |     |     |     |     |                  | 1181 | 1184 | 1202 | 1267 |      |      |      |
| B*4602  | 28 | 78               | 118 | 148 | 208 | 248 | 298 | 388 | 448 | 478 | 528 | 558 | 628 |     |     |     |     |                  | 1181 | 1184 | 1202 | 1209 | 1267 |      |      |
| B*15111 | 28 | 78               | 118 | 148 | 208 | 248 | 298 | 388 | 448 | 478 | 538 | 548 | 628 | 648 |     |     |     |                  | 1181 | 1184 | 1201 | 1287 | 1297 |      |      |
| B*15112 | 28 | 78               | 118 | 148 | 208 | 248 | 298 | 388 | 448 | 478 | 538 | 548 | 628 | 648 |     |     |     |                  | 1181 | 1184 | 1201 | 1287 | 1297 |      |      |
| B*5701  | 28 | 78               | 118 | 188 | 218 | 268 | 308 | 388 | 438 | 478 | 528 | 548 | 568 | 578 | 628 |     |     |                  | 1181 | 1184 | 1192 | 1201 | 1267 | 1297 |      |
| B*5704  | 28 | 78               | 118 | 188 | 218 | 268 | 338 | 368 | 418 | 478 | 528 | 548 | 568 | 578 | 608 | 628 |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*5702  | 28 | 78               | 118 | 188 | 218 | 268 | 338 | 348 | 418 | 478 | 528 | 548 | 568 | 578 | 618 | 628 |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*57031 | 28 | 78               | 118 | 188 | 218 | 268 | 338 | 348 | 438 | 478 | 528 | 548 | 568 | 578 | 618 | 628 |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*57032 | 28 | 78               | 118 | 188 | 218 | 268 | 338 | 348 | 438 | 478 | 528 | 548 | 568 | 578 | 618 |     |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*57035 | 28 | 78               | 118 | 188 | 218 | 268 | 298 | 348 | 418 | 478 | 528 | 548 | 568 | 578 | 608 | 618 | 628 |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*5705  | 28 | 78               | 118 | 188 | 218 | 268 | 298 | 388 | 438 | 478 | 508 | 528 | 548 | 568 | 578 | 588 | 598 | 628              | 648  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 |
| B*1516  | 28 | 78               | 118 | 188 | 218 | 268 | 298 | 388 | 438 | 478 | 528 | 548 | 568 | 578 | 628 | 648 |     |                  | 1181 | 1184 | 1199 | 1204 | 1259 | 1267 | 1297 |
| B*1517  | 28 | 78               | 118 | 188 | 218 | 268 | 298 | 388 | 438 | 478 | 528 | 548 | 568 | 578 | 628 |     |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*5706  | 28 | 78               | 118 | 188 | 218 | 268 | 308 | 388 | 438 | 478 | 528 | 548 | 568 | 578 | 628 |     |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*5707  | 28 | 78               | 118 | 188 | 218 | 266 | 308 | 348 | 438 | 478 | 528 | 548 | 568 | 578 | 618 | 628 |     |                  | 1181 | 1184 | 1191 | 1197 | 1199 | 1204 | 1232 |
| B*1508  | 28 | 78               | 118 | 158 | 208 | 248 | 298 | 388 | 448 | 478 | 538 | 548 | 628 | 648 |     |     |     |                  | 1181 | 1184 | 1201 | 1267 | 1297 |      |      |
| B*1556  | 28 | 78               | 118 | 158 | 208 | 248 | 298 | 388 | 448 | 478 | 538 | 548 | 628 | 648 |     |     |     |                  | 1181 | 1184 | 1201 | 1267 | 1297 |      |      |
| B*1521  | 28 | 78               | 118 | 178 | 208 | 248 | 298 | 388 | 448 | 478 | 538 | 548 | 628 | 648 |     |     |     |                  | 1181 | 1184 | 1201 | 1232 | 1267 | 1297 |      |
| B*1544  | 28 | 78               | 118 | 178 | 208 | 248 | 298 | 388 | 438 | 468 | 538 | 548 | 568 | 608 | 628 | 648 |     |                  | 1181 | 1184 | 1201 | 1232 | 1267 | 1297 |      |

| id | patchwork region |     |     |     |     |     |     |     |     |     | satellite region |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|----|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|    | 28 78            | 118 | 168 | 218 | 268 | 318 | 368 | 418 | 478 | 538 |                  | 588 | 638 | 688 | 738 | 788 | 838 | 888 | 938 | 988 | 1038 | 1088 | 1138 | 1188 | 1238 | 1288 | 1338 | 1388 | 1438 | 1488 | 1538 | 1588 | 1638 | 1688 | 1738 | 1788 | 1838 | 1888 | 1938 | 1988 | 2038 | 2088 | 2138 | 2188 | 2238 | 2288 | 2338 | 2388 | 2438 | 2488 | 2538 | 2588 | 2638 | 2688 | 2738 | 2788 | 2838 | 2888 | 2938 | 2988 | 3038 | 3088 | 3138 | 3188 | 3238 | 3288 | 3338 | 3388 | 3438 | 3488 | 3538 | 3588 | 3638 | 3688 | 3738 | 3788 | 3838 | 3888 | 3938 | 3988 | 4038 | 4088 | 4138 | 4188 | 4238 | 4288 | 4338 | 4388 | 4438 | 4488 | 4538 | 4588 | 4638 | 4688 | 4738 | 4788 | 4838 | 4888 | 4938 | 4988 | 5038 | 5088 | 5138 | 5188 | 5238 | 5288 | 5338 | 5388 | 5438 | 5488 | 5538 | 5588 | 5638 | 5688 | 5738 | 5788 | 5838 | 5888 | 5938 | 5988 | 6038 | 6088 | 6138 | 6188 | 6238 | 6288 | 6338 | 6388 | 6438 | 6488 | 6538 | 6588 | 6638 | 6688 | 6738 | 6788 | 6838 | 6888 | 6938 | 6988 | 7038 | 7088 | 7138 | 7188 | 7238 | 7288 | 7338 | 7388 | 7438 | 7488 | 7538 | 7588 | 7638 | 7688 | 7738 | 7788 | 7838 | 7888 | 7938 | 7988 | 8038 | 8088 | 8138 | 8188 | 8238 | 8288 | 8338 | 8388 | 8438 | 8488 | 8538 | 8588 | 8638 | 8688 | 8738 | 8788 | 8838 | 8888 | 8938 | 8988 | 9038 | 9088 | 9138 | 9188 | 9238 | 9288 | 9338 | 9388 | 9438 | 9488 | 9538 | 9588 | 9638 | 9688 | 9738 | 9788 | 9838 | 9888 | 9938 | 9988 | 10038 | 10088 | 10138 | 10188 | 10238 | 10288 | 10338 | 10388 | 10438 | 10488 | 10538 | 10588 | 10638 | 10688 | 10738 | 10788 | 10838 | 10888 | 10938 | 10988 | 11038 | 11088 | 11138 | 11188 | 11238 | 11288 | 11338 | 11388 | 11438 | 11488 | 11538 | 11588 | 11638 | 11688 | 11738 | 11788 | 11838 | 11888 | 11938 | 11988 | 12038 | 12088 | 12138 | 12188 | 12238 | 12288 | 12338 | 12388 | 12438 | 12488 | 12538 | 12588 | 12638 | 12688 | 12738 | 12788 | 12838 | 12888 | 12938 | 12988 | 13038 | 13088 | 13138 | 13188 | 13238 | 13288 | 13338 | 13388 | 13438 | 13488 | 13538 | 13588 | 13638 | 13688 | 13738 | 13788 | 13838 | 13888 | 13938 | 13988 | 14038 | 14088 | 14138 | 14188 | 14238 | 14288 | 14338 | 14388 | 14438 | 14488 | 14538 | 14588 | 14638 | 14688 | 14738 | 14788 | 14838 | 14888 | 14938 | 14988 | 15038 | 15088 | 15138 | 15188 | 15238 | 15288 | 15338 | 15388 | 15438 | 15488 | 15538 | 15588 | 15638 | 15688 | 15738 | 15788 | 15838 | 15888 | 15938 | 15988 | 16038 | 16088 | 16138 | 16188 | 16238 | 16288 | 16338 | 16388 | 16438 | 16488 | 16538 | 16588 | 16638 | 16688 | 16738 | 16788 | 16838 | 16888 | 16938 | 16988 | 17038 | 17088 | 17138 | 17188 | 17238 | 17288 | 17338 | 17388 | 17438 | 17488 | 17538 | 17588 | 17638 | 17688 | 17738 | 17788 | 17838 | 17888 | 17938 | 17988 | 18038 | 18088 | 18138 | 18188 | 18238 | 18288 | 18338 | 18388 | 18438 | 18488 | 18538 | 18588 | 18638 | 18688 | 18738 | 18788 | 18838 | 18888 | 18938 | 18988 | 19038 | 19088 | 19138 | 19188 | 19238 | 19288 | 19338 | 19388 | 19438 | 19488 | 19538 | 19588 | 19638 | 19688 | 19738 | 19788 | 19838 | 19888 | 19938 | 19988 | 20038 | 20088 | 20138 | 20188 | 20238 | 20288 | 20338 | 20388 | 20438 | 20488 | 20538 | 20588 | 20638 | 20688 | 20738 | 20788 | 20838 | 20888 | 20938 | 20988 | 21038 | 21088 | 21138 | 21188 | 21238 | 21288 |

| patchwork region |    |    |     |     |     |     |     |     |     | satellite region |     |     |     |     |     |     |     |  |  |  |      |      |      |      |
|------------------|----|----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|-----|-----|-----|-----|-----|--|--|--|------|------|------|------|
| B-40012          | 28 | 69 | 139 | 168 | 208 | 248 | 298 | 348 | 438 | 458              | 498 | 508 | 528 | 538 | 548 | 618 |     |  |  |  | 1178 | 1184 | 1201 | 1285 |
| B-40033          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 438 | 458              | 498 | 508 | 528 | 538 | 548 |     |     |  |  |  | 1178 | 1184 | 1201 | 1285 |
| B-40034          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 438 | 458              | 498 | 508 | 528 | 538 | 548 | 618 | 628 |  |  |  | 1178 | 1184 | 1201 | 1272 |
| B-40025          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 438 | 458              | 498 | 508 | 528 | 538 | 548 | 618 |     |  |  |  | 1178 | 1184 | 1201 | 1285 |
| B-40023          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 418 | 458              | 498 | 508 | 528 | 538 | 548 | 618 |     |  |  |  | 1178 | 1184 | 1201 | 1292 |
| B-44101          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 468              | 498 | 508 | 528 | 538 | 548 | 618 | 628 |  |  |  | 1178 | 1184 | 1201 | 1233 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 468              | 498 | 508 | 528 | 538 | 548 | 618 | 628 |  |  |  | 1173 | 1178 | 1184 | 1201 |
| B-44105          | 28 | 68 | 138 | 168 | 208 | 278 | 298 | 348 | 428 | 468              | 498 | 508 | 528 | 538 | 548 | 618 | 628 |  |  |  | 1178 | 1184 | 1201 | 1233 |
| B-44103          | 28 | 68 | 138 | 168 | 208 | 278 | 298 | 348 | 428 | 468              | 498 | 508 | 528 | 538 | 548 | 618 | 628 |  |  |  | 1178 | 1184 | 1201 | 1233 |
| B-44105          | 28 | 68 | 138 | 168 | 208 | 278 | 298 | 348 | 428 | 468              | 498 | 508 | 528 | 538 | 548 | 618 | 628 |  |  |  | 1178 | 1184 | 1201 | 1233 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 | 528 | 538 | 548 | 608 | 628 |  |  |  | 1178 | 1184 | 1201 | 1232 |
| B-44102          | 28 | 68 | 138 | 168 | 208 | 248 | 298 | 348 | 428 | 478              | 498 | 508 |     |     |     |     |     |  |  |  |      |      |      |      |

Table 31-5

|         | patchwork region |    |     |     |     |     |     |     |     |     |     |     | satellite region |     |      |      |      |      |      |      |      |      |      |      |
|---------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|------|------|------|------|------|------|------|------|------|------|
| B*4701  | 28               | 58 | 138 | 188 | 228 | 258 | 288 | 368 | 438 | 458 | 508 | 538 | 548              | 578 | 1178 | 1184 | 1201 | 1233 | 1267 | 1285 |      |      |      |      |
| B*4007  | 28               | 58 | 138 | 158 | 208 | 248 | 288 | 348 | 438 | 458 | 498 | 508 | 528              | 538 | 548  | 1178 | 1184 | 1201 | 1233 | 1267 | 1272 | 1285 | 1292 |      |
| B*44072 | 28               | 58 | 138 | 168 | 218 | 258 | 288 | 368 | 428 | 478 | 508 | 528 | 538              | 548 | 568  | 1178 | 1184 | 1201 | 1232 | 1267 | 1272 | 1285 | 1292 |      |
| B*4408  | 28               | 58 | 118 | 168 | 218 | 258 | 288 | 368 | 428 | 478 | 508 | 528 | 538              | 548 | 568  | 1181 | 1184 | 1201 | 1232 | 1267 | 1272 | 1285 | 1292 |      |
| B*1301  | 28               | 58 | 118 | 168 | 218 | 258 | 288 | 358 | 438 | 458 | 518 | 528 | 538              | 548 | 568  | 1178 | 1184 | 1201 | 1232 | 1267 | 1272 | 1285 | 1297 |      |
| B*1306  | 28               | 58 | 118 | 168 | 218 | 258 | 288 | 358 | 438 | 458 | 518 | 528 | 538              | 548 | 568  | 1178 | 1184 | 1201 | 1232 | 1267 | 1272 | 1285 | 1297 |      |
| B*1302  | 28               | 58 | 118 | 168 | 218 | 258 | 308 | 358 | 438 | 458 | 518 | 528 | 538              | 548 | 568  | 1178 | 1184 | 1201 | 1233 | 1267 | 1272 | 1285 | 1297 |      |
| B*1303  | 28               | 58 | 118 | 168 | 218 | 258 | 308 | 358 | 438 | 478 | 518 | 528 | 538              | 548 | 568  | 1178 | 1184 | 1201 | 1233 | 1267 | 1272 | 1285 | 1297 |      |
| B*1304  | 28               | 58 | 118 | 168 | 218 | 258 | 308 | 388 | 438 | 478 | 518 | 528 | 538              | 548 | 568  | 1178 | 1184 | 1201 | 1233 | 1267 | 1272 | 1285 | 1297 |      |
| B*0802  | 28               | 58 | 98  | 158 | 218 | 258 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0808  | 28               | 58 | 98  | 158 | 218 | 248 | 288 | 348 | 418 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0803  | 28               | 58 | 98  | 158 | 218 | 268 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 598 | 628  | 1201 | 1232 | 1242 | 1267 | 1272 | 1285 |      |      |      |
| B*3525  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 538 | 568              | 598 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0812  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0801  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0807  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0805  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0810  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0811  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0813  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*0809  | 28               | 58 | 98  | 158 | 208 | 248 | 308 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1201 | 1267 | 1297 |      |      |      |      |      |      |
| B*1529  | 28               | 58 | 98  | 158 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 538 | 568              | 618 | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |      |
| B*0804  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 648  | 1171 | 1201 | 1272 | 1285 | 1296 |      |      |      |      |
| B*4012  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 618  | 1184 | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1503  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 1201 | 1267 | 1297 |      |      |      |      |      |      |
| B*1584  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 538 | 568              | 628 | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |      |
| B*1561  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 568 | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |      |
| B*1562  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 598  | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |
| B*1547  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1549  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1554  | 28               | 58 | 98  | 168 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*3904  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1188 | 1201 | 1267 | 1297 |      |      |      |      |
| B*1506  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 618  | 628  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1510  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1537  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1518  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1551  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1552  | 28               | 58 | 98  | 178 | 208 | 248 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |      |      |
| B*1523  | 28               | 58 | 98  | 178 | 218 | 268 | 288 | 348 | 438 | 478 | 508 | 528 | 538              | 548 | 568  | 578  | 628  | 648  | 1201 | 1267 | 1297 |      |      |      |
| B*6307  | 28               | 58 | 98  | 148 | 208 | 248 | 288 | 348 | 428 | 468 | 508 | 538 | 568              | 618 | 628  | 1232 | 1267 | 1272 | 1285 | 1292 |      |      |      |      |
| B*5506  | 28               | 58 | 128 | 148 | 208 | 248 | 308 | 348 | 438 | 478 | 518 | 538 | 548              | 618 | 628  | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 | 1293 |      |      |
| B*7801  | 28               | 58 | 128 | 158 | 208 | 248 | 308 | 348 | 438 | 478 | 518 | 538 | 548              | 618 | 628  | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 | 1293 |      |      |
| B*78022 | 28               | 58 | 128 | 158 | 208 | 248 | 308 | 348 | 438 | 478 | 518 | 538 | 548              | 618 | 628  | 1184 | 1201 | 1233 | 1263 | 1267 | 1272 | 1293 |      |      |
| B*5306  | 28               | 58 | 128 | 158 | 218 | 268 | 288 | 348 | 438 | 478 | 518 | 538 | 548              | 568 | 578  | 598  | 628  | 1184 | 1201 | 1232 | 1242 | 1267 | 1272 | 1293 |
| B*4406  | 28               | 58 | 128 | 158 | 218 | 268 | 288 | 348 | 438 | 478 | 518 | 538 | 548              | 568 | 578  | 608  | 628  | 1184 | 1201 | 1232 | 1267 | 1272 | 1285 | 1292 |
| B*5104  | 28               | 58 | 128 | 158 | 218 | 268 | 288 | 348 | 438 | 478 | 518 | 538 | 548              | 568 | 578  | 598  | 618  | 628  | 1184 | 1201 | 1232 | 1263 | 1267 | 1272 |



|        | patchwork region |    |     |     |     |     |     |     |     |     | satellite region |     |     |     |     |     |     |     |      |      |      |      |      |      |
|--------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| B-5106 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 558 | 548 | 568 | 578 | 618 | 628 | 184 | 1201 | 1263 | 1267 | 1272 | 1293 |      |
| B-5111 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 408 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1267 | 1272 | 1293 |
| B-5113 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 408 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1267 | 1272 | 1293 |
| B-5116 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 458 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5110 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 458 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 184 | 1201 | 1233 | 1285 |      |      |      |
| B-5121 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 468 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5101 | 28               | 88 | 128 | 168 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5102 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 478 | 518 | 538              | 548 | 568 | 578 | 588 | 618 | 628 | 184 | 1201 | 1233 | 1263 | 1267 | 1272 |      |
| B-5104 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1267 | 1272 | 1293 |
| B-5124 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1267 | 1272 | 1293 |
| B-5103 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5109 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5108 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5123 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 478 | 518 | 538              | 548 | 568 | 578 | 588 | 618 | 628 | 184 | 1201 | 1233 | 1263 | 1267 | 1272 |      |
| B-5119 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5114 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1264 | 1263 | 1267 |
| B-5117 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1263 | 1267 | 1272 |
| B-5118 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1233 | 1266 | 1263 | 1267 |
| B-5112 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              | 538 | 548 | 568 | 578 | 588 | 618 | 628 | 184  | 1201 | 1228 | 1233 | 1263 | 1267 |
| B-5108 | 28               | 88 | 128 | 158 | 218 | 268 | 308 | 348 | 438 | 478 | 518              |     |     |     |     |     |     |     |      |      |      |      |      |      |

Table 31-7

[illegible]

[illegible]

Table 31-9

|         | patchwork region |    |     |     |     |     |     |     |     |     | satellite region |     |     |     |     |     |     |     |      |      |
|---------|------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|------------------|-----|-----|-----|-----|-----|-----|-----|------|------|
|         | 1B               | 5B | 10B | 14B | 20B | 24B | 29B | 40B | 43B | 46B | 50B              | 52B | 55B | 61B | 62B | 63B | 11B | 12B | 127  | 1285 |
| B*6702  | 1B               | 5B | 10B | 14B | 20B | 24B | 29B | 40B | 43B | 46B | 50B              | 52B | 55B | 61B | 62B | 63B | 11B | 12B | 127  | 1285 |
| B*0713  | 1B               | 5B | 10B | 14B | 20B | 24B | 29B | 40B | 43B | 46B | 50B              | 52B | 55B | 61B | 62B | 63B | 11B | 12B | 127  | 1285 |
| B*3919  | 1B               | 5B | 12B | 17B | 20B | 24B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 61B | 62B | 63B | 11B | 12B | 127  | 1285 |
| B*3806  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*3807  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1807  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*3701  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*3704  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*3705  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1802  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1803  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1811  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1805  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1806  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1808  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1812  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1810  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1813  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1809  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*4805  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*4807  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*4802  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*27053 | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*4405  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*3805  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*3912  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1402  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1404  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*1405  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*14061 | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*14062 | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*4422  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*8201  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |
| B*6202  | 1B               | 5B | 12B | 15B | 21B | 26B | 29B | 40B | 43B | 46B | 50B              | 51B | 53B | 54B | 56B | 57B | 61B | 62B | 1272 | 1285 |

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Table 32

| Correspondence of the patchworks and SEQ ID Nos for B |            |      |      |      |      |      |      |      |      |      |
|---|------------|------|------|------|------|------|------|------|------|------|
| patchwork   | SEQ ID NO: |      |      |      |      |      |      |      |      |      |
| 1B  | 1080       |      |      |      |      |      |      |      |      |      |
| 2B  | 1081       |      |      |      |      |      |      |      |      |      |
| 3B  | 1082       |      |      |      |      |      |      |      |      |      |
| 4B  | 1083       |      |      |      |      |      |      |      |      |      |
| 5B  | 1084       |      |      |      |      |      |      |      |      |      |
| 6B  | 1085       | 1088 |      |      |      |      |      |      |      |      |
| 7B  | 1086       |      |      |      |      |      |      |      |      |      |
| 8B  | 1087       |      |      |      |      |      |      |      |      |      |
| 9B  | 1089       | 1094 |      |      |      |      |      |      |      |      |
| 10B   | 1090       |      |      |      |      |      |      |      |      |      |
| 11B   | 1091       | 1095 |      |      |      |      |      |      |      |      |
| 12B   | 1092       | 1096 |      |      |      |      |      |      |      |      |
| 13B   | 1093       |      |      |      |      |      |      |      |      |      |
| 14B   | 1097       | 1103 | 1106 |      |      |      |      |      |      |      |
| 15B   | 1098       | 1104 |      |      |      |      |      |      |      |      |
| 16B   | 1099       |      |      |      |      |      |      |      |      |      |
| 17B   | 1100       | 1105 | 1107 | 1108 |      |      |      |      |      |      |
| 18B   | 1101       |      |      |      |      |      |      |      |      |      |
| 19B   | 1102       |      |      |      |      |      |      |      |      |      |
| 20B   | 1109       | 1113 | 1115 |      |      |      |      |      |      |      |
| 21B   | 1110       | 1114 |      |      |      |      |      |      |      |      |
| 22B   | 1111       |      |      |      |      |      |      |      |      |      |
| 23B   | 1112       |      |      |      |      |      |      |      |      |      |
| 24B   | 1116       | 1120 |      |      |      |      |      |      |      |      |
| 25B   | 1117       | 1121 | 1122 |      |      |      |      |      |      |      |
| 26B   | 1118       |      |      |      |      |      |      |      |      |      |
| 27B   | 1119       |      |      |      |      |      |      |      |      |      |
| 28B   | 1123       | 1129 | 1133 |      |      |      |      |      |      |      |
| 29B   | 1124       | 1130 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 |
| 30B   | 1125       | 1131 |      |      |      |      |      |      |      |      |
| 31B   | 1126       |      |      |      |      |      |      |      |      |      |
| 32B   | 1127       | 1132 |      |      |      |      |      |      |      |      |
| 33B   | 1128       |      |      |      |      |      |      |      |      |      |
| 34B   | 1142       | 1149 | 1153 | 1156 | 1157 |      |      |      |      |      |
| 35B   | 1143       | 1150 | 1154 |      |      |      |      |      |      |      |
| 36B   | 1144       | 1151 |      |      |      |      |      |      |      |      |

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Table 32 (continued)

| Correspondence of the patchworks and SEQ ID Nos for B |            |      |      |      |      |      |      |      |      |  |
|---|------------|------|------|------|------|------|------|------|------|--|
| patchwork   | SEQ ID NO: |      |      |      |      |      |      |      |      |  |
| 37B   | 1145       |      |      |      |      |      |      |      |      |  |
| 38B   | 1146       |      |      |      |      |      |      |      |      |  |
| 39B   | 1147       |      |      |      |      |      |      |      |      |  |
| 40B   | 1148       | 1152 | 1155 |      |      |      |      |      |      |  |
| 41B   | 1158       | 1162 |      |      |      |      |      |      |      |  |
| 42B   | 1159       |      |      |      |      |      |      |      |      |  |
| 43B   | 1160       | 1163 | 1164 |      |      |      |      |      |      |  |
| 44B   | 1161       |      |      |      |      |      |      |      |      |  |
| 45B   | 1165       |      |      |      |      |      |      |      |      |  |
| 46B   | 1166       |      |      |      |      |      |      |      |      |  |
| 47B   | 1167       | 1169 |      |      |      |      |      |      |      |  |
| 48B   | 1168       |      |      |      |      |      |      |      |      |  |
| 49B   | 1170       | 1179 |      |      |      |      |      |      |      |  |
| 50B   | 1175       | 1180 |      |      |      |      |      |      |      |  |
| 51B   | 1183       | 1212 | 1218 | 1222 |      |      |      |      |      |  |
| 52B   | 1195       | 1213 | 1219 | 1223 | 1226 |      |      |      |      |  |
| 53B   | 1206       | 1215 |      |      |      |      |      |      |      |  |
| 54B   | 1209       | 1216 | 1220 | 1224 |      |      |      |      |      |  |
| 55B   | 1211       | 1217 | 1221 | 1225 |      |      |      |      |      |  |
| 56B   | 1227       | 1246 |      |      |      |      |      |      |      |  |
| 57B   | 1229       | 1247 | 1251 | 1253 | 1255 | 1256 |      |      |      |  |
| 58B   | 1239       | 1249 | 1252 | 1254 |      |      |      |      |      |  |
| 59B   | 1242       | 1250 |      |      |      |      |      |      |      |  |
| 60B   | 1259       | 1274 | 1277 |      |      |      |      |      |      |  |
| 61B   | 1261       | 1275 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 |  |
| 62B   | 1269       | 1276 |      |      |      |      |      |      |      |  |
| 63B   | 1288       | 1295 |      |      |      |      |      |      |      |  |
| 64B   | 1296       | 1299 |      |      |      |      |      |      |      |  |

Table 33.

| Correspondence of Primers |                   |                    |
|---------------------------|-------------------|--------------------|
|                           | SEQ ID NOS.       | SEQ ID NOS.        |
| Primers for DRB1          | 590, 591, 591     | 593                |
| Primers for DPB1          | 448, 449          | 450-455            |
| Primers for DQB1          | 504, 505          | 506                |
| Primers for A             | 899, 900, 903-905 | 901, 902, 906, 907 |
| Primers for B             | 1073, 1075-1077   | 1074, 1078, 1079   |

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[0084]

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- 10 (3) Inoko, H. et al.: PCR-RFLP, Handbook of HLA typing techniques (edited by Hui, K.M. & Bidwell, J.L.), CRC press, Florida, U.S.A., 1993, p.9
- (4) Erlich, H. et al.: HLA-DR, -DQ and -DP typing using PCR amplification and immobilized probes, European  
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Industrial Applicability

- 20 [0085] According to the present invention, there are provided a kit and method that are suitable for processing of a large number of specimens and enable a large number of high accuracy typing tests by one test for one specimen, and oligonucleotides and primers used therefor.

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SEQUENCE LISTING

5

<110> NISSHINBO INDUSTRIES. INC.  
SYSTEM RESEARCH INC.

10

<120> KIT AND METHOD FOR DETERMINING HLA TYPES

<130> 13140P1174

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<140>

<141> 2001-06-01

<150> JP 2000-164798

<151> 2000-06-01

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<160> 1298

<170> PatentIn Ver. 2.1

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18

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<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence:capture

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18

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<210> 3

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

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<223> Description of Artificial Sequence:capture

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18

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 50 <210> 9  
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|    | <220>  |    |
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| 5  | <400> 9  |    |
|    | ccagtccttat ggtccc                               | 16 |
|    | <210> 10   |    |
|    | <211> 18   |    |
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|    | <220>  |    |
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| 15 | <400> 10   |    |
|    | ttacgggtccc tctggcca                             | 18 |
|    | <210> 11   |    |
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| 20 | <212> DNA  |    |
|    | <213> Artificial Sequence                        |    |
|    | <220>  |    |
|    | <223> Description of Artificial Sequence:capture |    |
| 25 | <400> 11   |    |
|    | ttacgggtctc tctggcca                             | 18 |
|    | <210> 12   |    |
|    | <211> 17   |    |
| 30 | <212> DNA  |    |
|    | <213> Artificial Sequence                        |    |
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|    | <223> Description of Artificial Sequence:capture |    |
| 35 | <400> 12   |    |
|    | cctctggcca gtacacc                               | 17 |
|    | <210> 13   |    |
|    | <211> 17   |    |
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|    | <213> Artificial Sequence                        |    |
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|    | <223> Description of Artificial Sequence:capture |    |
| 45 | <400> 13   |    |
|    | cctctgggca gtacacc                               | 17 |
|    | <210> 14   |    |
|    | <211> 16   |    |
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| 55 | <223> Description of Artificial Sequence:capture |    |

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|    | ggccagtlaca cccaatg                              | 16 |
| 5  | <210> 15   |    |
|    | <211> 16   |    |
|    | <212> DNA  |    |
|    | <213> Artificial Sequence                        |    |
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|    | <223> Description of Artificial Sequence:capture |    |
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|    | ggccagtica cccaatg                               | 16 |
| 15 | <210> 16   |    |
|    | <211> 18   |    |
|    | <212> DNA  |    |
|    | <213> Artificial Sequence                        |    |
| 20 | <220>  |    |
|    | <223> Description of Artificial Sequence:capture |    |
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| 25 | cagtlacaccc atgaattt                             | 18 |
|    | <210> 17   |    |
|    | <211> 18   |    |
|    | <212> DNA  |    |
|    | <213> Artificial Sequence                        |    |
| 30 | <220>  |    |
|    | <223> Description of Artificial Sequence:capture |    |
|    | <400> 17   |    |
| 35 | cagtlacagcc atgaattt                             | 18 |
|    | <210> 18   |    |
|    | <211> 18   |    |
|    | <212> DNA  |    |
| 40 | <213> Artificial Sequence                        |    |
|    | <220>  |    |
|    | <223> Description of Artificial Sequence:capture |    |
|    | <400> 18   |    |
| 45 | atggagatga ggagttct                              | 18 |
|    | <210> 19   |    |
|    | <211> 18   |    |
|    | <212> DNA  |    |
| 50 | <213> Artificial Sequence                        |    |
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|    | atggagacga ggagttct                              | 18 |

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| 5  | <210> 20<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
|    | <220><br><223> Description of Artificial Sequence:capture      |    |
| 10 | <400> 20<br>atggagatga gcagttct                                | 18 |
| 15 | <210> 21<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
|    | <220><br><223> Description of Artificial Sequence:capture      |    |
| 20 | <400> 21<br>atggagacga gcagttct                                | 18 |
| 25 | <210> 22<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
|    | <220><br><223> Description of Artificial Sequence:capture      |    |
| 30 | <400> 22<br>agttctacgt ggacctgg                                | 18 |
| 35 | <210> 23<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
|    | <220><br><223> Description of Artificial Sequence:capture      |    |
| 40 | <400> 23<br>agttctatgt ggacctgg                                | 18 |
| 45 | <210> 24<br><211> 15<br><212> DNA<br><213> Artificial Sequence |    |
|    | <220><br><223> Description of Artificial Sequence:capture      |    |
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| 5  | acigtciggt glllgcct                              | 18 |
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| 15 | gagtlcagca aatttggga                             | 18 |
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| 35 | ctgttcacgca gattttaga                            | 18 |
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| 5  | <213> Artificial Sequence                        |    |
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| 10 | <400> 41   |    |
|    | tttgacccgc aatttgca                              | 18 |
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|    | <212> DNA  |    |
| 15 | <213> Artificial Sequence                        |    |
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|    | <210> 43   |    |
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| 25 | <212> DNA  |    |
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| 30 | <400> 43   |    |
|    | catcgctgtg ctaaaaca                              | 18 |
|    | <210> 44   |    |
|    | <211> 18   |    |
| 35 | <212> DNA  |    |
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|    | catcgctgtg acaaaaca                              | 18 |
|    | <210> 45   |    |
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| 55 | <211> 18   |    |
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**10**

### 〈213〉 Artificial Sequence

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### $\langle 213 \rangle$ Artificial Sequence

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<213> Artificial Sequence

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<213> Artificial Sequence

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<213> Artificial Sequence

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BNSDOCID: &lt;EP 1291440A1 | &gt;

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|    | gcgggaccc gcagagga   | 18 |
| 5  | <210> 57<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
| 10 | <220><br><223> Description of Artificial Sequence:capture      |    |
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| 15 | <210> 58<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
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| 30 | <220><br><223> Description of Artificial Sequence:capture      |    |
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| 35 | <210> 60<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
| 40 | <220><br><223> Description of Artificial Sequence:capture      |    |
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| 45 | <210> 61<br><211> 18<br><212> DNA<br><213> Artificial Sequence |    |
| 50 | <220><br><223> Description of Artificial Sequence:capture      |    |
|    | <400> 61<br>attaggaatg gtgactgg                                | 18 |
| 55 | <210> 62   |    |

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       <210> 64  
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| 20 | <p>&lt;210&gt; 132<br/>             &lt;211&gt; 18<br/>             &lt;212&gt; DNA<br/>             &lt;213&gt; Artificial Sequence</p> |    |
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| 50 | <p>&lt;220&gt;<br/>&lt;223&gt; Description of Artificial Sequence:capture</p>   |    |
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| 10 | <p>&lt;220&gt;<br/>&lt;223&gt; Description of Artificial Sequence:capture</p>   |    |
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| 20 | <p>&lt;220&gt;<br/>&lt;223&gt; Description of Artificial Sequence:capture</p>   |    |
| 25 | <p>&lt;400&gt; 770<br/>gacaagcggg ccgcggt</p> <p>&lt;210&gt; 771<br/>&lt;211&gt; 15<br/>&lt;212&gt; DNA<br/>&lt;213&gt; Artificial Sequence</p> | 17 |
| 30 | <p>&lt;220&gt;<br/>&lt;223&gt; Description of Artificial Sequence:capture</p>   |    |
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|    | aggagaacgc gcgcttcg                              | 18 |
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|    | gacitgtcca caccggaagg agta                       | 24 |
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55       <210> 895  
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| 5  | <210> 906  |    |
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17

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$\langle 211 \rangle$  17

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17

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$\langle 211 \rangle$  17

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15 <210> 1255  
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17

17

17.

17

17

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| 30 | ccgggcataa ccagttac                              | 17 |
|    | <210> 1283                                       |    |
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| 40 | gcgggtataa ccagtttc                              | 17 |
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|    | <210> 1292                                       |    |
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| 25 | cgtggagtcg ctccgca                               | 17 |
|    | <210> 1293                                       |    |
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| 55 | ggaaggagac gctggag                               | 17 |

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35

40

45

50

55

# Claims

1. A typing kit for determining HLA genotype of a test specimen by hybridization between a nucleic acid sequence derived from the test specimen and oligonucleotides, which comprises a substrate on which the oligonucleotides are immobilized through covalent bonds, wherein the oligonucleotides are 10-24 nucleotide length and are derived from sequences of a group of genes belonging to HLA class I or class II antigen on a human genome and each of the oligonucleotides includes polymorphism of each gene as alloantigen in the sequence.
2. The typing kit according to claim 1, wherein a surface of the substrate is coated with carbodiimide groups or isocyanate groups and the covalent bonds are formed through reactions of the carbodiimide groups or isocyanate groups and linkers added to ends of the oligonucleotides.
3. The typing kit according to claim 1, wherein the linker is an amino group, or a compound having an amino group or a homopolymer of thymidine residues at an end of the compound.
4. The typing kit according to claim 1, wherein the oligonucleotides are immobilized in an area on a surface of the substrate having a size of 10-1,000  $\mu\text{m}$  in diameter.
5. The typing kit according to claim 1, wherein the oligonucleotides consist of DNA or a peptide nucleic acid.
6. The typing kit according to claim 1, wherein class I antigen is an antigen controlled by any of gene loci coding for HLA-A, HLA-B, HLA-C, HLA-D, HLA-E, HLA-F and HLA-G and class II antigen is an antigen controlled by any of gene loci coding for HLA-DQ, HLA-DR or HLA-DP.
7. The typing kit according to claim 1 or 6, wherein HLA-DQ is an antigen derived from any of DQA1, DQA2, DQB1 and DQB2 gene loci.
8. The typing kit according to claim 1 or 6, wherein HLA-DR is an antigen derived from any of DRA, DRB1, DRB3, DRB4 and DRB5 gene loci.
9. The typing kit according to claim 1 or 6, wherein HLA-DP is an antigen derived from any of DPA1, DPA2, DPB1 and DPB2 gene loci.
10. The typing kit according to claim 1 or 6, wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1072 or 1080-1298.
11. The typing kit according to any one of claims 1, 6 and 7, which is for determining HLA-DQA1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 1-54.
12. The typing kit according to any one of claims 1, 6 and 7, which is for determining HLA-DQB1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 55-140 or 507-589.
13. The typing kit according to any one of claims 1, 6 and 8, which is for determining HLA-DRA genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 141-144.
14. The typing kit according to any one of claims 1, 6 and 8, which is for determining genotypes of HLA-DRB1, HLA-DRB3, HLA-DRB4, HLA-DRB5, HLA-DRB6 or HLA-DRB7, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 145-323 or 594-853.
15. The typing kit according to any one of claims 1, 6 and 9, which is for determining HLA-DPA1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 324-348.
16. The typing kit according to any one of claims 1, 6 and 9, which is for determining HLA-DPB1 genotype, and wherein the oligonucleotides contain at least one of the nucleic acid sequences of SEQ ID NOS: 349-397 or 456-503.
17. The typing kit according to claim 10, wherein at least one of the oligonucleotides is replaced with an oligonucleotide of 8-24 nucleotide length obtained by extending or shortening any of the nucleic acid sequences of SEQ ID NOS: 1-397, 456-503, 507-589, 594-898, 908-1072 or 1080-1298 for a gene sequence on the genome at 5' or 3' end or

at both ends without eliminating or changing nucleotides associated with the gene polymorphism to have optimized binding affinity for the hybridization.

18. The typing kit according to any one of claims 1, 2, 4, 5 and 10-17, wherein at least one of the oligonucleotides is an oligonucleotide whose binding affinity for the hybridization is reduced by replacing an arbitrary nucleotide not involved in the gene polymorphism with a spacer compound.
19. The typing kit according to claim 18, wherein the spacer compound has a nucleic acid frame that does not have complementary binding property with any kind of nucleotides.
20. PCR primers for excising and amplifying a nucleic acid sequence associated with gene polymorphism of HLA class I antigen or class II antigen of a test specimen.
21. The PCR primers according to claim 20, which is for low accuracy genotyping, and wherein a combination of 5' primer and 3' primer corresponding to HLA-DQ consists of at least one of (SEQ ID NOS: 398 and 400) and (SEQ ID NOS: 399 and 400), and a combination of 5' primer and 3' primer corresponding to HLA-DR consists of at least one of (SEQ ID NOS: 401 and 403) and (SEQ ID NOS: 402 and 403).
22. The PCR primers according to claim 20, which is for high accuracy genotyping, and wherein a combination of 5' primer and 3' primer corresponding to HLA-DQB1 consists of at least one of (SEQ ID NOS: 404 and 406), (SEQ ID NOS: 405 and 406), (SEQ ID NOS: 407 and 409), (SEQ ID NOS: 408 and 409), (SEQ ID NOS: 410 and 412) and (SEQ ID NOS: 411 and 412), and a combination of 5' primer and 3' primer corresponding to HLA-DRB1 consists of at least one of (SEQ ID NOS: 413 and 417), (SEQ ID NOS: 414 and 417), (SEQ ID NOS: 415 and 417) and (SEQ ID NOS: 416 and 417).
23. The PCR primers according to claim 20, which is for high accuracy genotyping, and wherein a combination of 5' primer and 3' primer corresponding to HLA-DQA1 consists of at least one of (SEQ ID NOS: 418 and 420) and (SEQ ID NOS: 419 and 420), a combination of 5' primer and 3' primer corresponding to HLA-DQB1 is (SEQ ID NOS: 421 and 422), a combination of 5' primer and 3' primer corresponding to HLA-DRA is (SEQ ID NOS: 423 and 424), a combination of 5' primer and 3' primer corresponding to HLA-DRB2 consists of at least one of (SEQ ID NOS: 425 and 428), (SEQ ID NOS: 426 and 428) and (SEQ ID NOS: 427 and 428), a combination of 5' primer and 3' primer corresponding to HLA-DRB3 consists of at least one of (SEQ ID NOS: 429 and 431) and (SEQ ID NOS: 430 and 431), a combination of 5' primer and 3' primer corresponding to HLA-DRB4 consists of at least one of (SEQ ID NOS: 432 and 433) and (SEQ ID NOS: 434 and 435), a combination of 5' primer and 3' primer corresponding to HLA-DRB5 is (SEQ ID NOS: 436 and 437), a combination of 5' primer and 3' primer corresponding to HLA-DRB6 consists of at least one of (SEQ ID NOS: 438 and 439) and (SEQ ID NOS: 439 and 440), and a combination of 5' primer and 3' primer corresponding to HLA-DRB7 is (SEQ ID NOS: 441 and 442), a combination of 5' primer and 3' primer corresponding to HLA-DPA1 is (SEQ ID NOS: 443 and 444) and a combination of 5' primer and 3' primer corresponding to HLA-DPB1 consists of at least one of (SEQ ID NOS: 445 and 446) and (SEQ ID NOS: 445 and 447).
24. A method for determining HLA genotype of a test specimen, which comprises allowing hybridization of the oligonucleotides on the substrate of the typing kit according to any one of claims 1-16 with a nucleic acid sequence derived from the specimen and detecting occurrence of hybridization of the oligonucleotides and the nucleic acid sequence derived from the specimen.
25. The method for determining HLA genotype of a test specimen according to claim 24, comprising the steps of:
  - carrying out low accuracy typing of HLA genotype of the specimen by performing first PCR amplification using the primers for low accuracy genotyping according to claim 21 and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with the oligonucleotides contained in the typing kit according to any one of claims 1-16, and detecting occurrence of hybridization of the nucleic acid sequence derived from the specimen and each of the oligonucleotides; and
  - carrying out high accuracy HLA genotyping of the specimen by performing second PCR amplification based on the above determination result using primers appropriately selected from the primers for high accuracy genotyping according to claim 22 and a nucleic acid sequence derived from the specimen as a template, allowing hybridization of the amplification product with the oligonucleotides contained in the typing kit according to any one of claims 1-16, and detecting occurrence of hybridization of the nucleic acid sequence derived from



the specimen and each of the oligonucleotides.

- 5      **26.** The method for determining HLA genotype of a test specimen according to claim 24, wherein PCR amplification is performed by using a nucleic acid sequence derived from the test specimen as a template and the primers for high accuracy genotyping according to claim 24 (22 or 23?) and the amplification product is hybridized with each of the oligonucleotides contained in the typing kit according to any one of claims 1-16.
- 10      **27.** The method for determining HLA genotype of a test specimen according to claim 24, which comprises preparing alignment of gene sequences of each HLA, and setting a nucleotide sequence in which at least two nucleotide polymorphisms or sequence polymorphisms involving the HLA typing are observed in a nucleotide sequence consisting of 1-10 nucleotides as a patchwork segment, and/or setting a nucleotide sequence in which at least one nucleotide polymorphism or sequence polymorphism is observed as a satellite segment, and  
15      finding the patchworks and/or the satellites in gene sequences of all of the HLA genes, performing typing by combination of the patchworks and/or the satellites and judging whether each of HLA typing of the test specimen is homozygote or heterozygote together with determining the types of HLA.
- 28.** The method for determining HLA genotype of a test specimen according to claim 27, wherein a pseudogene of DRB1 is included in the HLA types to be determined.
- 20      **29.** The typing kit according to claim 1 or 6, wherein the oligonucleotides comprises at least one of the nucleotide sequences of SEQ ID NOS: 908-1071, and the kit is for determining HLA-A genotype.
- 25      **30.** The typing kit according to claim 1 or 6, wherein the oligonucleotides comprises at least one of the nucleotide sequences of SEQ ID NOS: 1080-1298, and the kit is for determining HLA-DRA genotype.

*Fig.1*DQA1

|   |    |    |    |    |    |    |    |    |    |    |   |
|---|----|----|----|----|----|----|----|----|----|----|---|
| B | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | B |
|   | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |   |
|   | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |   |
|   | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |   |
|   | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |   |
| B | 51 | 52 | 53 | 54 |    |    |    |    |    |    | B |

*Fig.2*DQB1(low resolution)

|   |    |    |    |    |  |  |  |  |  |  |   |
|---|----|----|----|----|--|--|--|--|--|--|---|
| B | 55 | 56 | 57 | 58 |  |  |  |  |  |  | B |
|---|----|----|----|----|--|--|--|--|--|--|---|

DQB1(high resolution)

|   |     |     |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| B | 59  | 60  | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | B |
|   | 69  | 70  | 71  | 72  | 73  | 74  | 75  | 76  | 77  | 78  |   |
|   | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  |   |
|   | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  | 97  | 98  |   |
|   | 99  | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 |   |
|   | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 |   |
|   | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 |   |
|   | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 |   |
| B | 139 | 140 |     |     |     |     |     |     |     |     | B |

Fig. 3

DRA

|   |     |     |     |     |
|---|-----|-----|-----|-----|
| B | 141 | 142 | 143 | 144 |
|---|-----|-----|-----|-----|

|   |
|---|
| B |
|---|

Fig. 4

DRB1(low resolution)

|   |     |     |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| B | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | B |
| B | 155 | 156 |     |     |     |     |     |     |     |     | B |

DRB1(high resolution)

|   |     |     |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| B | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | B |
|   | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 |   |
|   | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 |   |
|   | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 |   |
|   | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 |   |
|   | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |   |
|   | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 |   |
|   | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 |   |
|   | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 |   |
| B | 247 | 248 | 249 | 250 |     |     |     |     |     |     | B |

Fig. 5

DRB3, DRB4, DRB5, DRB6 (high resolution)

|   |     |     |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| B | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | B |
|   | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 |   |
|   | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 |   |
|   | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 |   |
|   | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 |   |
|   | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 |   |
|   | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 |   |
| B | 321 | 322 | 323 |     |     |     |     |     |     |     | B |

Fig. 6

DPA1

|   |     |     |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| B | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | B |
|   | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 |   |
| B | 344 | 345 | 346 | 347 | 348 |     |     |     |     |     | B |

Fig. 7

DPB1

|   |     |     |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| B | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | B |
|   | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 |   |
|   | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 |   |
|   | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 |   |
| B | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 |     | B |

Fig. 8

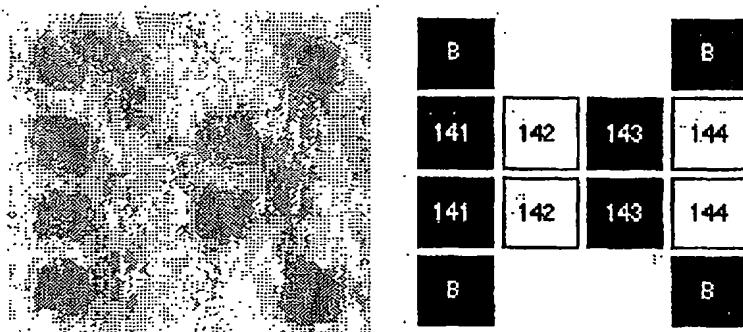
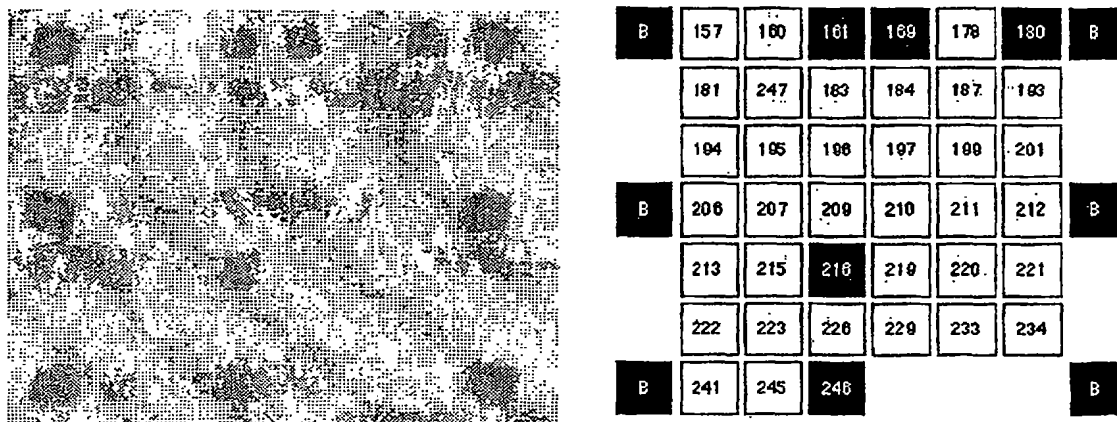


Fig. 9



Fig. 10



BNSDOCID: <EP\_\_\_\_\_1291440A1\_I\_>

[illegible]

Fig.12

|   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| B | 507 | 510 | 513 | 517 | 520 | 522 | 524 |     | 533 | 536 | 537 | 538 | 540 | 543 | 544 |
| B | 508 | 511 | 514 | 518 | 521 | 523 | 525 |     | 534 |     |     | 539 | 541 |     |     |
| B | 509 | 512 | 515 | 519 |     |     | 526 | 531 | 535 |     |     |     | 542 |     |     |
| B |     |     | 516 |     |     |     | 527 |     |     |     |     |     |     |     |     |
| B |     |     |     |     |     |     | 528 | 532 |     |     |     |     |     |     |     |
| B |     |     |     |     |     |     | 529 |     |     |     |     |     |     |     |     |
| B |     |     |     |     |     |     | 530 |     |     |     |     |     |     |     |     |
|   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   |
| B | 545 | 546 | 547 | 548 |     | 559 |     |     |     | 570 | 572 | 574 |     | 580 | 586 |
| B |     |     |     | 549 |     | 560 |     |     |     | 571 | 573 | 575 |     | 581 | 587 |
| B |     |     |     | 550 |     | 561 | 565 | 568 | 569 |     |     | 576 |     | 582 | 588 |
| B |     |     |     | 551 |     | 562 | 566 |     |     |     |     | 577 | 579 | 583 | 589 |
| B |     |     |     | 552 |     | 563 | 567 |     |     |     |     | 578 |     | 584 |     |
| B |     |     |     | 553 |     | 564 |     |     |     |     |     |     |     | 585 |     |
| B |     |     |     | 554 | 557 |     |     |     |     |     |     |     |     |     |     |
| B |     |     |     | 555 | 558 |     |     |     |     |     |     |     |     |     |     |
| B |     |     |     | 556 |     |     |     |     |     |     |     |     |     |     |     |

324



|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| B   | B   | B   | B   | B   |
|     |     |     |     | 799 |
| 795 | 796 | 797 | 798 |     |

Fig. 15

[illegible]

[illegible][illegible][illegible]

Fig. 17-1

|   | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    |
|---|------|------|------|------|------|------|------|------|------|------|------|------|------|
| B | 1080 | 1084 |      | 1089 | 1094 | 1097 | 1103 | 1106 |      | 1109 | 1113 | 1115 | 1116 |
| B | 1081 | 1085 | 1088 | 1090 |      | 1098 | 1104 |      |      | 1110 | 1114 |      | 1117 |
| B | 1082 | 1086 |      | 1091 | 1095 | 1099 |      |      |      | 1111 |      |      | 1118 |
| B | 1083 | 1087 |      | 1092 | 1096 | 1100 | 1105 | 1107 | 1108 | 1112 |      |      | 1119 |
| B |      |      |      | 1093 |      | 1101 |      |      |      |      |      |      |      |
| B |      |      |      |      |      | 1102 |      |      |      |      |      |      |      |
| B |      |      |      |      |      |      |      |      |      |      |      |      |      |
|   | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    |
| B | 1170 | 1179 | 1181 |      |      |      |      | 1196 |      |      |      | 1227 | 1246 |
| B | 1171 |      | 1182 |      |      |      |      | 1197 |      |      |      | 1228 |      |
| B | 1172 |      | 1183 | 1212 | 1218 | 1222 |      | 1198 |      |      |      | 1229 | 1247 |
| B | 1173 |      | 1184 |      |      |      |      | 1199 | 1214 |      |      | 1230 |      |
| B | 1174 |      | 1185 |      |      |      |      | 1200 |      |      |      | 1231 |      |
| B | 1175 | 1180 | 1186 |      |      |      |      | 1201 |      |      |      | 1232 | 1248 |
| B | 1176 |      | 1187 |      |      |      |      | 1202 |      |      |      | 1233 |      |
| B | 1177 |      | 1188 |      |      |      |      | 1203 |      |      |      | 1234 |      |
| B | 1178 |      | 1189 |      |      |      |      | 1204 |      |      |      | 1235 |      |
| B |      |      | 1190 |      |      |      |      | 1205 |      |      |      | 1236 |      |
| B |      |      | 1191 |      |      |      |      | 1206 | 1215 |      |      | 1237 |      |
| B |      |      | 1192 |      |      |      |      | 1207 |      |      |      | 1238 |      |
| B |      |      | 1193 |      |      |      |      | 1208 |      |      |      | 1239 | 1249 |
| B |      |      | 1194 |      |      |      |      | 1209 | 1216 | 1220 | 1224 | 1240 |      |
| B |      |      | 1195 | 1213 | 1219 | 1223 | 1226 | 1210 |      |      |      | 1241 |      |
| B |      |      |      |      |      |      |      | 1211 | 1217 | 1221 | 1225 | 1242 | 1250 |
| B |      |      |      |      |      |      |      |      |      |      |      | 1243 |      |
| B |      |      |      |      |      |      |      |      |      |      |      | 1244 |      |
| B |      |      |      |      |      |      |      |      |      |      |      | 1245 |      |

*Fig. 17-2*

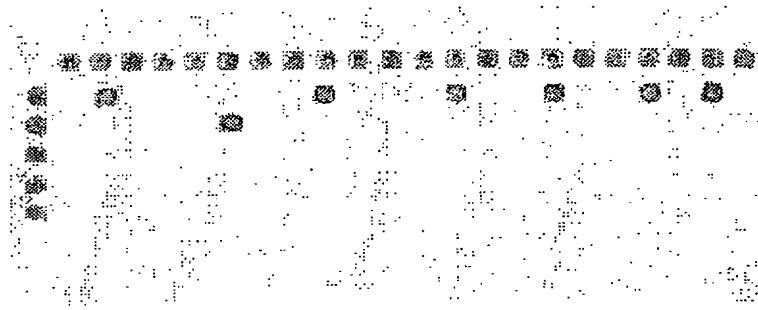
| B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1120 |      | 1123 | 1129 | 1133 |      |      |      |      |      |      |      | 1142 | 1149 |
| 1121 | 1122 | 1124 | 1130 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1143 | 1150 |
|      |      | 1125 | 1131 |      |      |      |      |      |      |      |      | 1144 | 1151 |
|      |      | 1126 |      |      |      |      |      |      |      |      |      | 1145 |      |
|      |      | 1127 | 1132 |      |      |      |      |      |      |      |      | 1146 |      |
|      |      | 1128 |      |      |      |      |      |      |      |      |      | 1147 |      |
|      |      |      |      |      |      |      |      |      |      |      |      | 1148 | 1152 |
| B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    | B    |
|      |      |      |      | 1257 |      |      |      |      |      |      |      |      | 1285 |
|      |      |      |      | 1258 |      |      |      |      |      |      |      |      | 1286 |
| 1251 | 1253 | 1255 | 1256 | 1259 | 1274 | 1277 |      |      |      |      |      |      | 1287 |
|      |      |      |      | 1260 |      |      |      |      |      |      |      |      | 1288 |
|      |      |      |      | 1261 | 1275 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1289 |
|      |      |      |      | 1262 |      |      |      |      |      |      |      |      | 1290 |
|      |      |      |      | 1263 |      |      |      |      |      |      |      |      | 1291 |
|      |      |      |      | 1264 |      |      |      |      |      |      |      |      | 1292 |
|      |      |      |      | 1265 |      |      |      |      |      |      |      |      | 1293 |
|      |      |      |      | 1266 |      |      |      |      |      |      |      |      | 1294 |
|      |      |      |      | 1267 |      |      |      |      |      |      |      |      |      |
|      |      |      |      | 1268 |      |      |      |      |      |      |      |      |      |
| 1252 | 1254 |      |      | 1269 | 1276 |      |      |      |      |      |      |      |      |
|      |      |      |      | 1270 |      |      |      |      |      |      |      |      |      |
|      |      |      |      | 1271 |      |      |      |      |      |      |      |      |      |
|      |      |      |      | 1272 |      |      |      |      |      |      |      |      |      |
|      |      |      |      | 1273 |      |      |      |      |      |      |      |      |      |

330

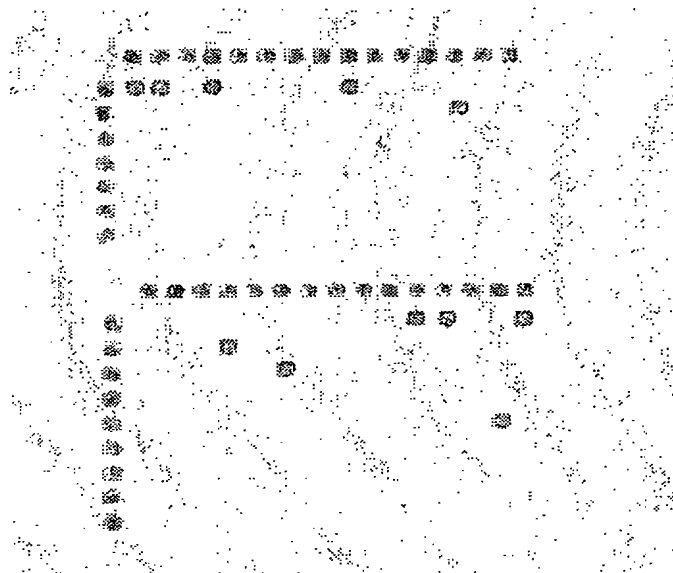
Fig.19A

|   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| B | 507 | 510 | 513 | 517 | 520 | 522 | 524 |     | 533 | 536 | 537 | 538 | 540 | 543 | 544 |
| B | 508 | 511 | 514 | 518 | 521 | 523 | 525 |     | 534 |     |     | 539 | 541 |     |     |
| B | 509 | 512 | 515 | 519 |     |     | 526 | 531 | 535 |     |     |     | 542 |     |     |
| B |     |     | 516 |     |     |     | 527 |     |     |     |     |     |     |     |     |
| B |     |     |     |     |     |     | 528 | 532 |     |     |     |     |     |     |     |
| B |     |     |     |     |     |     | 529 |     |     |     |     |     |     |     |     |
| B |     |     |     |     |     |     | 530 |     |     |     |     |     |     |     |     |
|   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   | B   |
| B | 545 | 546 | 547 | 548 |     | 559 |     |     |     | 570 | 572 | 574 |     | 580 | 586 |
| B |     |     |     | 549 |     | 560 |     |     |     | 571 | 573 | 575 |     | 581 | 587 |
| B |     |     |     | 550 |     | 561 | 565 | 568 | 569 |     |     | 576 |     | 582 | 588 |
| B |     |     |     | 551 |     | 562 | 566 |     |     |     |     | 577 | 579 | 583 | 589 |
| B |     |     |     | 552 |     | 563 | 567 |     |     |     |     | 578 |     | 584 |     |
| B |     |     |     | 553 |     | 564 |     |     |     |     |     |     |     | 585 |     |
| B |     |     |     | 554 | 557 |     |     |     |     |     |     |     |     |     |     |
| B |     |     |     | 555 | 558 |     |     |     |     |     |     |     |     |     |     |
| B |     |     |     | 556 |     |     |     |     |     |     |     |     |     |     |     |

*Fig.18B*



*Fig.19B*





*F i g. 20A-1*

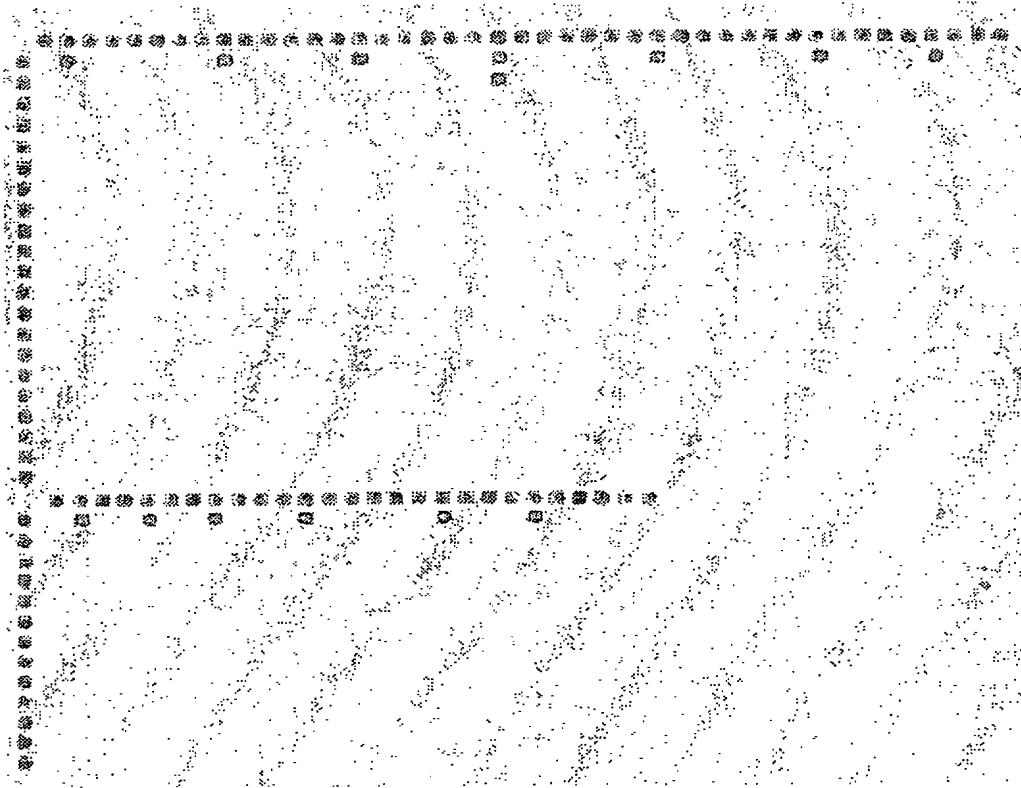
[illegible]

|     |     |     |     |
|-----|-----|-----|-----|
| B   | B   | B   | B   |
|     |     |     | 799 |
| 796 | 797 | 798 |     |

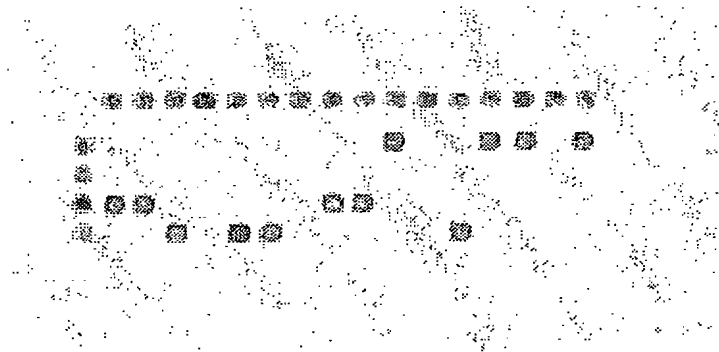
Fig. 22A

[illegible]

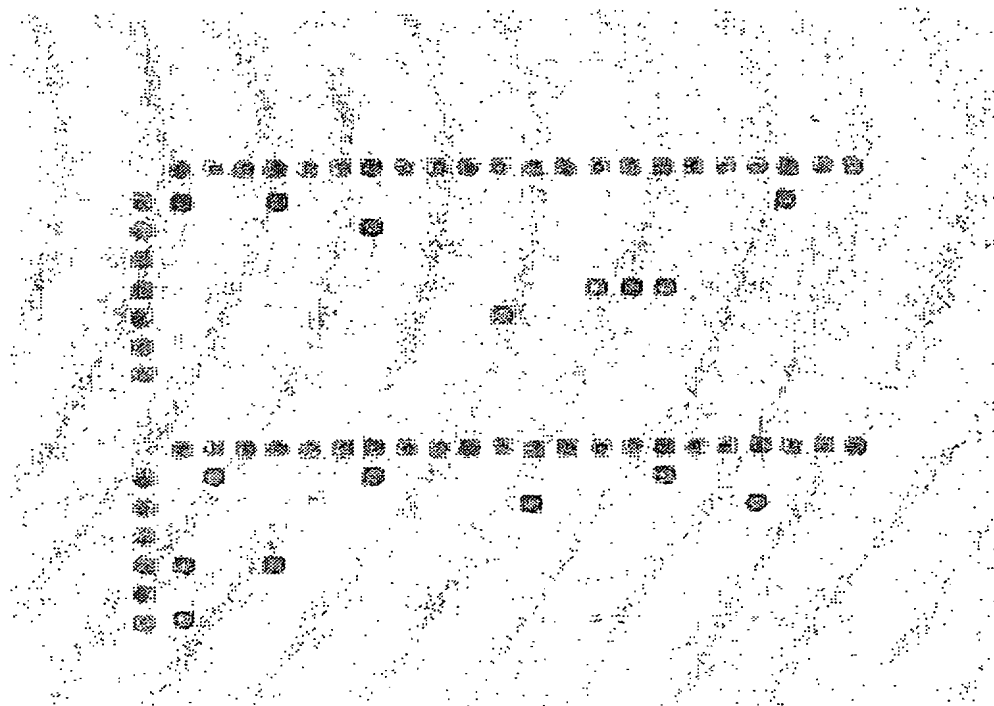
*Fig.20B*



*Fig.21B*

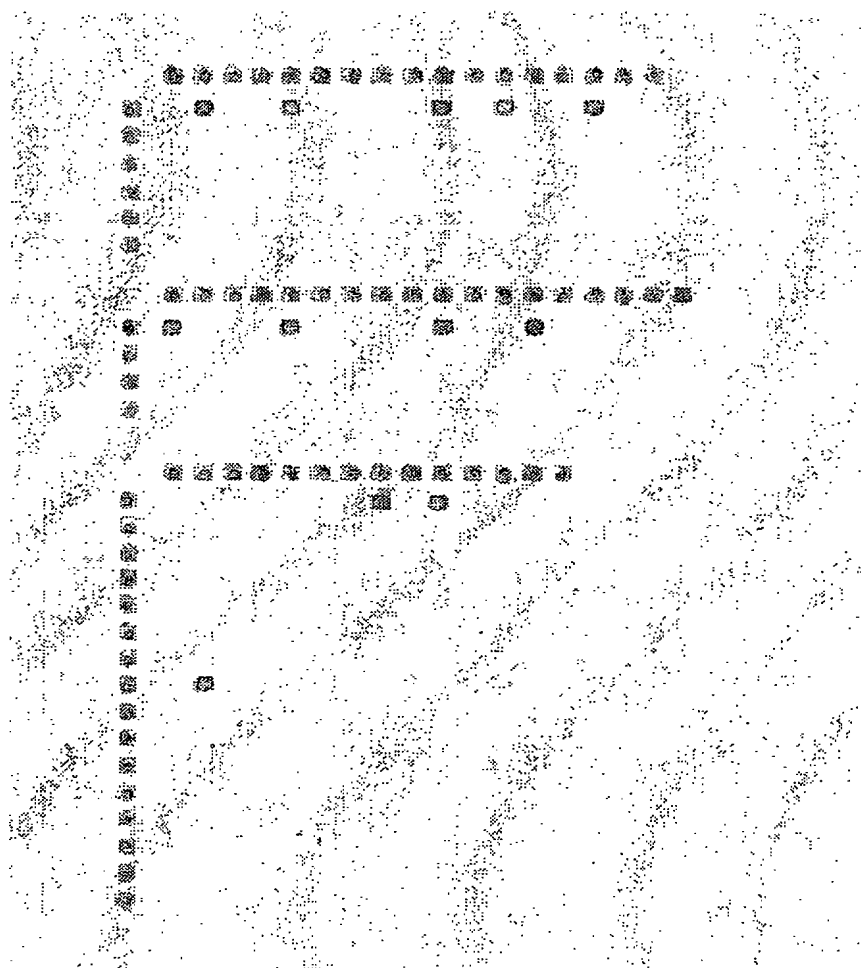


*Fig.22B*

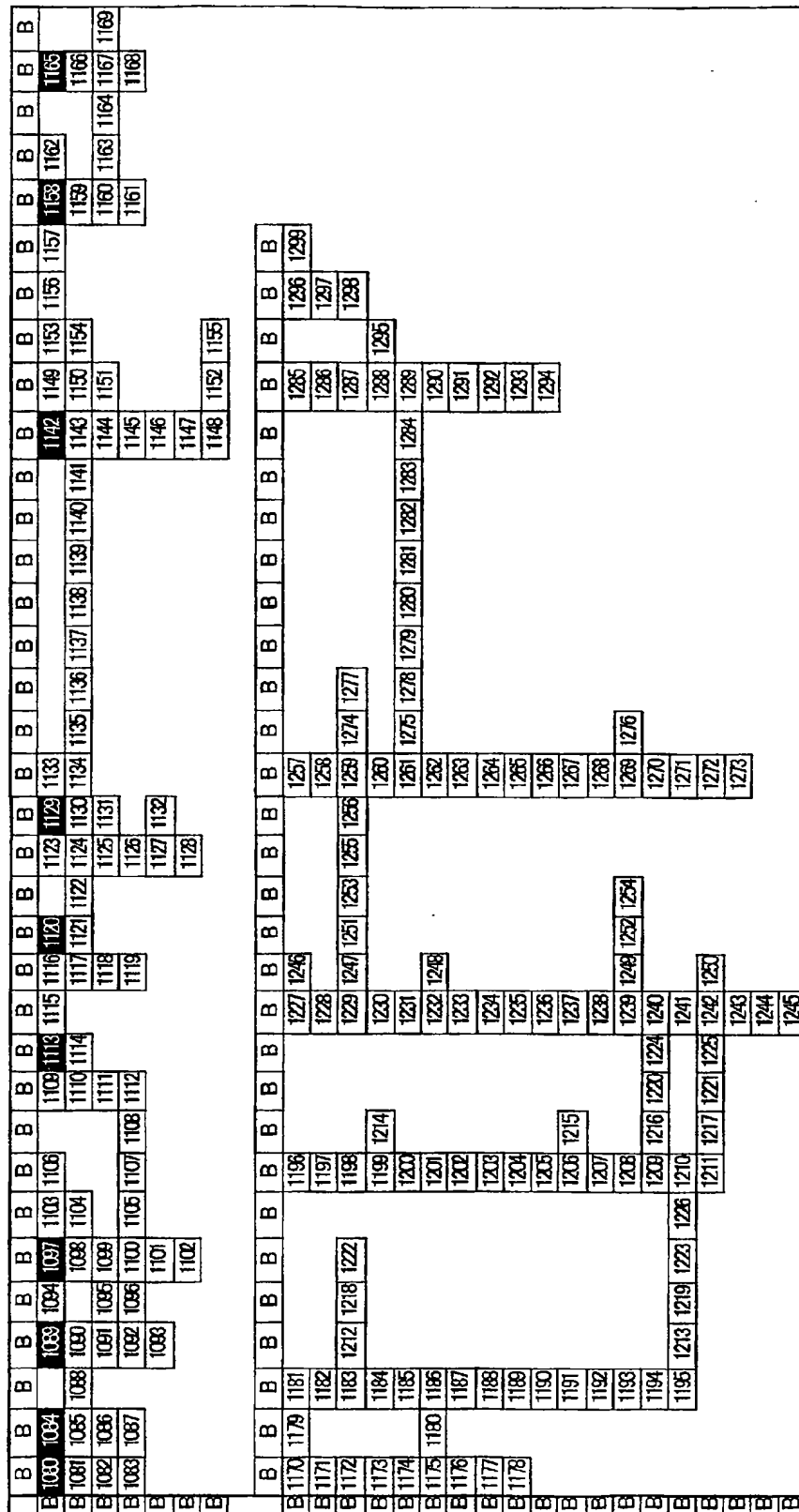


[illegible]

*Fig.23B*

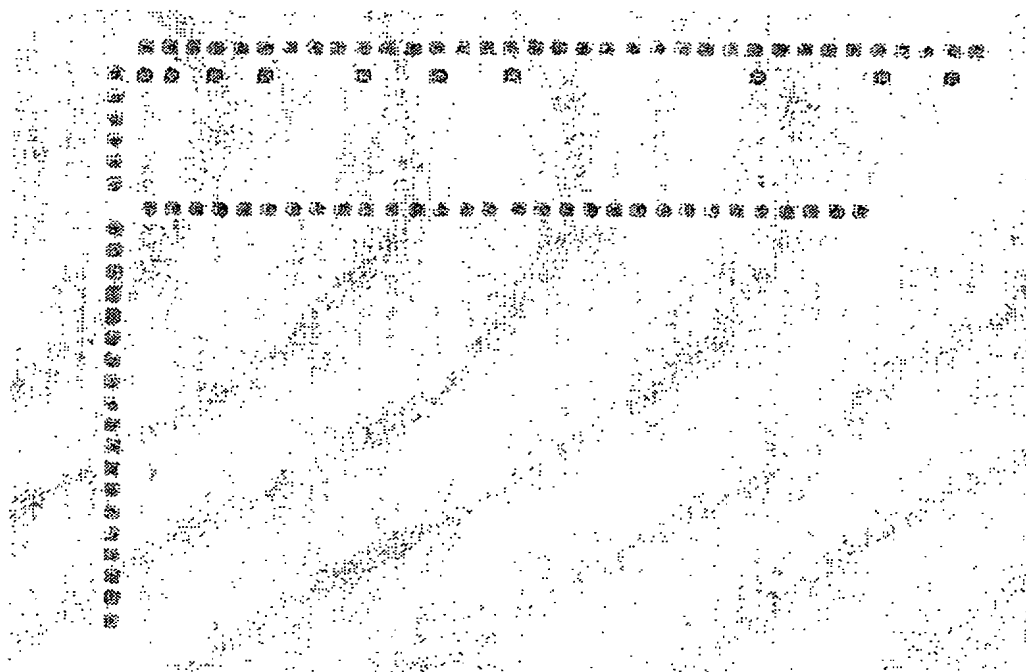


**Fig. 24A**





*Fig.24B*



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/04662

| A. CLASSIFICATION OF SUBJECT MATTER<br>Int.Cl <sup>7</sup> C12Q1/68, C12M1/00, C12N15/09, G01N33/53   |   |  |
|---|---|--|
| According to International Patent Classification (IPC) or to both national classification and IPC   |   |  |
| B. FIELDS SEARCHED  |   |  |
| Minimum documentation searched (classification system followed by classification symbols)<br>Int.Cl <sup>7</sup> C12Q1/68, C12M1/00, C12N15/09, G01N33/53                               |   |  |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched   |   |  |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>CA (STN), REGISTRY (STN), WPI (DIALOG), BIOSIS (DIALOG) |   |  |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT  |   |  |
| Category*   | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.  |
| X   | JP 6-90757 A (The Kitasato Inst., Mitsui Petrochemical Ind. Ltd.),<br>04 May, 1994 (04.05.94) (Family: none)  | 1-30   |
| X   | JP 6-303998 A (Sumitomo Electric Industries, Ltd.),<br>01 November, 1994 (01.11.94) (Family: none)  | 1-30   |
| X   | WO 94/21818 A1 (N.V. Innogetics S.A.)<br>29 September, 1994 (29.09.94)<br>& EP 689609 A & US 5883238 A<br>& JP 8-507690 A   | 1-30   |
| X   | WO 00/31295 A1 (Shionogi & Co., Ltd.),<br>02 June, 2000 (02.06.00),<br>& AU 6004699 A   | 1-30   |
| X   | WO 00/65088 A (AMERSHAM PHARMACIA BIOTECH AB),<br>02 November, 2000 (02.11.00),<br>& AU 5062500 A   | 1-30   |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.  |   |  |
| *<br>"A"<br>"E"<br>"L"<br>"O"<br>"P"  | Special categories of cited documents:<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier document but published on or after the international filing date<br>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)<br>"O" document referring to an oral disclosure, use, exhibition or other means<br>"P" document published prior to the international filing date but later than the priority date claimed | "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<br>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone<br>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<br>"&" document member of the same patent family |
| Date of the actual completion of the international search<br>04 September, 2001 (04.09.01)  |   | Date of mailing of the international search report<br>18 September, 2001 (18.09.01)  |
| Name and mailing address of the ISA/<br>Japanese Patent Office  |   | Authorized officer   |
| Facsimile No.   |   | Telephone No.  |

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/04662

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |  |                       |
|---|--|-----------------------|
| Category*   | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
| A   | JP 2000-135081 A (Kazusa DNA Kenkyusho, O uji Seiyaku K.K.,<br>Mitsui Chemicals, Ltd.),<br>16 May, 2000 (16.05.00) (Family: none)    | 1-30                  |
| A   | JP 2000-83647 A (Toshiba Corporation),<br>28 March, 2000 (28.03.00) (Family: none)   | 1-30                  |
| A   | WO 89/10977 A1 (Oxford Jean Technology Limited),<br>16 November, 1989 (16.11.89),<br>& EP 373203 A & US 5700637 A<br>& JP 3-505157 A | 1-30                  |

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## INTERNATIONAL SEARCH REPORT

International application No.

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**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

The inventions as set forth in claims 1 to 19 and 24 to 30 are regarded as a group of inventions relating to a typing kit for determining the genotype of a test sample HLA and a determination method with the use of the same.

On the other hand, the inventions as set forth in claims 20 to 23 are regarded as a group of inventions relating to primers for amplifying test sample HLA class I antigen or class II antigen genes.

Although these two groups of inventions have a common matter of being inventions relating to a test sample HLA, it has been well known that test sample HLAs per se vary among individuals. Thus, it does not appear that there is a technical relationship between these groups of inventions involving any special technical feature merely based on the fact of relating to a great number of different test sample HLAs.

Such being the case, these two groups of inventions are not considered as relating to a group of inventions so linked as to form a single general inventive concept.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest** ☐ The additional search fees were accompanied by the applicant's protest.  
☒ No protest accompanied the payment of additional search fees.

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